COAL AGE

The Weekly Journal of the Coal and Coke Industries

Volume 18 NEW YORK, THURSDAY, DECEMBER 30, 1920 Number 27

"Shocking Disclosures"

WHY should F. T. Miller, the "technical adviser on building" of the Calder committee, evidence such shocked surprise over the "disclosure" that in the year ended June 30, 1920, the National Coal Association assisted the Geological Survey in its statistical work to the extent of paying the salaries of four clerks? Certainly there was nothing secret about the matter. The details were all laid before Senator Frelinghuysen's committee more than a year ago. He was told that but for this timely financial assistance of the coal operators the weekly reports would have ceased to appear, and his only regret was that the government had been so niggardly in its appropriation for this work.

The printed records of the Senate Sub-Committee on Interstate Commerce are available to Mr. Miller for the asking. Furthermore, in the printed records of the Committee on Appropriations of the House in its hearings on the Sundry Civil Bill a year ago will be found the testimony of Director Smith of the Geological Survey asking for more money from Congress in order to obviate the necessity for help from the operators. This committee saw no evil influence at work and no statutory objection in the practice and were at first inclined to save the public treasury the amount asked if the coal men would continue their support.

No doubt Senator Calder and Mr. Miller are aware of all the facts in the case—if not they are guilty of wantonly wasting public money on this part of their investigation—and we can in consequence conclude that their motive in featuring this matter is to insinuate wrongdoing and improper relations.

The public wants no star chamber proceedings and, while interested in sensations, has a contempt for palpable efforts to influence its opinion by trials before newspaper juries by telling half truths.

Storage at the Mine

IN THIS issue an article affords information as to the storage system used at the Mather colliery plant. It is quite a general assumption that the stocking of coal will be unnecessary as soon as the railroads give good service, a conclusion which overlooks some of the real facts. The author of the article in question answers a few of these assumptions, but he by no means exhausts them. The Mather plant supplying coke ovens at Cleveland, Ohio, may, it is true, not be plagued in the future as custom mine operators often are and may find less use for storage accordingly.

Pickands-Mather Co. has its own railroad cars and is likely to receive them in normal times in a steady flow. As the plant may plan eventually to work regularly, even if not every day, the railroad will know in advance what requirements are to be made upon it and will give satisfactory service. But with the custom mine the business of the operation cannot be foreseen from day to day. It orders its cars one day to supply the needs of the next, and the service is likely to be uncertain accordingly.

Then again the firm may receive orders for a certain size of coal and none for that which remains after the ordered size is removed from the run of mine. If it has storage facilities, it will be able to store the size not wanted. If it does not have such facilities it must store in railroad cars the size for which it has no sale, consigning these cars to points where a sale may seem feasible. If then it fails to sell the coal at that point at a profitable rate it must sell it at a loss to save the demurrage. Provided the railroad is friendly, it may delay delivery of the unsold coal thus consigned and thus save the shipper demurrage. But if the railroad is not friendly and is unwilling to delay the transit, it will hurry the coal to market and will demand demurrage of the shipper for every day of delay in unloading.

Storage in piles at the mine will forestall this demurrage and make it possible to sell only on orders received, thus saving much money to the operator. Even in the anthracite region, where there is steady demand for coal, the small sizes often are not in request, and the largest of companies find storage advisable either at the mines or elsewhere.

If a mine has a call for run of mine only or if it has a demand for coal of different sizes in the exact proportion in which they are produced, and if with either of these conditions the railroad service is dependable, then the mine owners will find storage unnecessary and wasteful. But this rarely occurs, and storage in any other event pays, provided the coal is not of too fiery a nature. It may not pay in quantity and it may not be advisable to store in summer for winter disposal, but it will pay to keep some storage altogether apart from the good effect it will have in maintaining the morale of the men and in avoiding the possibility that the mine will have to shut down with only a part day's run or will have to start operation in the morning without either cars or storage.

Knowledge Still the Paramount Requisite

SOUND advice to New England business men was given by Dr. H. A. Garfield in his address before the associated industries of Massachusetts in Boston on Dec. 16, 1920. Elsewhere in this issue we publish an abstract of Dr. Garfield's remarks from notes kindly furnished by him. As Fuel Administrator he had unequalled opportunity to see from the inside how the coal industry functions and from a detached viewpoint he re-states the proposition he made two years ago to the coal operators and coal miners to set up a medium to promote knowledge and better understanding between the three parties at interest, the coal mine laborer, the producer and the consumer—that is, the public.

Coal consumers in New England were told that here-

tofore New England has organized to "get coal," but that henceforth she must organize "also to help those who produce and distribute it." It is plain that Dr. Garfield takes the position that coal, as a basic commodity and the raw material of industry, must henceforth be a matter of more than curious interest on the part of the public. However, he does not even imply that coal prices must be controlled or that distribution or production should be regulated, rather that trouble with coal, whether between miner and mine owner, producer and consumer or miner and public can best be settled by preventing its start. He believes that knowledge is power, and the way to acquire knowledge, in our present complex existence, is to organize for it.

Separation of the fact-gathering bodies from those who would use the facts is emphatically urged, accompanied by a plea for Federal support for the present agencies of government that collect facts on coal. It is aptly pointed out that the Bureau of Labor Statistics, Interstate Commerce Commission, Federal Trade Commission and Geological Survey each has a well defined, mutually exclusive field in the work of bringing together data on coal. What is lacking is, first, more data from these sources—possible if they are provided with more funds—and, second, a co-ordination of the coal worries of the nation with these facts.

Consumers in New England may be "sold" on the proposal of Dr. Garfield, but are the other interested parties—the coal operators and the miners? When first proposed, two years ago, the subject was considered by the coal operators, called together for this purpose by the National Coal Association. Those in favor were outnumbered by those opposed and nothing was done. Leading those opposed were the men from Illinois and Indiana. It must have been that these westerners were feeling a new spirit of independence, for their opposition was contrary to the spirit of their famous "Statement of Facts" addressed to the President of the United States on Dec. 1, 1914.

This statement, it will be recalled, was prepared for and authorized by the associations of operators in Illinois and Indiana. Oppressed by the discouraging outlook of low prices in highly competitive markets on one hand and rising labor costs on the other, these operators combined in a plea for "first consideration" in the Federal Trade Commission, then in process of formation. They summed up their case with the statement that "It is reasonable to assume that as long as the government sustains and encourages the principle of collective action—as evidenced by the exemption of labor unions from anti-trust measures—it would also sanction a plan enabling coal operators to co-operate in a similarly legitimate way, particularly if appropriate and definite governmental control were included to the extent, at least, of permitting all of such activities to be known to the public and provided that sufficient and ample penalties be provided and imposed for the violation of all such rules, agreements or laws as may be devised to regulate such collective actions. Coal operators would not object to, but, on the contrary, would invite such publicity and supervision."

Times have changed. Six years ago, when a considerable number of their companies were in the hands of receivers and there was no profit in the business, Illinois and Indiana operators complained that "other industries enjoy a degree of encouragement and protection by the government which is denied the coal mining industry. . . . Intimately affecting, as it does, the lives and welfare of all our citizens, the coal industry deserves and should receive at the hands of our law makers, attention proportionate to its importance." They pointed out that the "publications of the U. S. Geological Survey and the Bureau of Mines, while helpful in the physical operation of properties, do not contain statistics such as are furnished by the Agricultural Department, dealing with costs, values and distribution. The appropriations are entirely too small."

Desultory Coal Loading

IF MODERN machinery is to be enabled to do its proper work radical changes must be made in mine operation. It is essential that the room-and-pillar method be discarded and longwall take its place. Cogs will have to be used to hold up the roof, and they must be strong enough that the roof may be broken on their outer edges. It may be necessary to make them of sawn timber, so that they can be readily set up and as readily withdrawn as soon as the slack placed under them is removed. The roof will have to be broken in a long line of fracture, in such a way that no arching action will remain to support it and so that the structural form of the roof will be that of a cantilever. Cars will have to pass in one direction past the face and not, as at present, reciprocate or shuttle to it and from it.

Mining men declare that the manufacturers do not try to find out what the operator wants, and they declare loudly that the manufacturer is not co-operating. As a matter of fact, the mine operator is clinging to a form of operation that has been wasteful with man power and is almost ruinous with machine power. All cutting and loading should be done by day labor, so that the profit of new methods will be enjoyed and the inevitable costs of new methods will be met. The mine operator has not co-operated with the manufacturer. He has demanded a machine that will put on its coat and wait in the heading till the trip comes, and then take off its coat and push in the car, load it and put it out on the heading and wait for an hour or so for another. That is not the machine way. Steady movement is necessary. The cutting and the loading machines should, at least for a day, work in one direction, and the cars should always travel from left to right or from right to left.

Until there arises someone who appreciates what machinery involves and will supply the machine with real co-operation, machinery will fail to do a quarter of what it is capable of effecting. Mr. Levin's remarks on this subject, published in this issue, are to the point and are true of machines in general and coal loaders in particular.

Some time ago we printed an illustration of a number of German mine workers around the foot of a plane and remarked on the loss of labor involved. Go into almost any mine and, when a gathering locomotive arrives, note the throng of men lined up along the heading, squatting on shovels and "takin' a pull at the pipe" if smoking is permitted. The waste of time in the average coal mine is appalling. The inefficiency at the working face at a German mine must be indeed great if it compares with our own, and the meager output obtained per man seems to justify the idea that the German mine is even less labor-saving.

How Mather Colliery Stores Coal at the Mine In Times of Railroad-Car Shortage

When Cars Were Not Available Some Means of Keeping the Mine Running Became Imperative—A Storage Bin, a Conveyor System and a Locomotive Crane Solved the Problem and the Mine Now Operates, Cars or No Cars

By Donald J. Baker
Wilkinsburg, Pa.

MANY methods have been adopted by coal operators throughout the country to avoid the losses incident to the car shortage prevailing throughout the last year or so. Few indeed, if any, are the coal producers who at some time or other during the last twelvemonth have not "chafed at the bit" because of decreased production resulting from transportational causes beyond their control.

At many operations, particularly those subsidiary to large steel or allied industries, the parent firm has owned an abundance of railroad cars, but has been unable to get these moved to and from the mines with any degree of regularity. In such instances, of course, it is a lack of motive power that has caused the mine tie-up, but be it lack of cars or scarcity of locomotives, the result has been invariably the same—decreased production and the unemployment of many men. At many operations neither cars nor motive power could be had, and keeping the mine in full operation continuously has been doubly difficult.

Being highly flexible as a transport medium, the motor truck suddenly assumed a prominent position. It took a car shortage to bring home a realization of the economies obtainable through the utilization of the truck. Today more coal is being moved by this means than ever before, and many firms have learned by experience that the truck is more economical as a transporting agency than was believed possible.

The extensive use of such trucks has relieved the railroads of much heavy local hauling and they are now better able to distribute their cars and motive power where most needed by the country as a whole. Whatever may be the advantages attendant upon the utilization of motor-truck transport, it of course has its economic limitations. This limit probably is fixed more closely by the distance of haul than by local operating conditions. Where the market of a producer lies at any considerable distance from the mine, delivery by truck is out of the question. When this condition prevails, some other means must be provided for assuring steady production and preventing a coal shortage.

Up in Greene County, Pa., the officials of the Mather Collieries Co., as a result of car shortage, were confronted with a situation that perhaps closely paralleled what many coal operators throughout the country have experienced. The mine in question is situated in a newly-opened field where good roads have not yet been constructed. Even if improved highways had existed, it is questionable whether the motor truck could have been employed advantageously.

The hills in this region are steep and the country itself is a comparative wilderness, all of which means that any market available would have been located at a considerable distance from the mine. All the coal produced, however, is absorbed by the parent company, to be made into coke for use in the steel mills of the Pickands-

Mather Co. Thus the Mather Collieries Co. could not throw its output upon the open market in times of car shortage.

A Good Town Helps to Make Men Contented

Simultaneously with the construction of the mine buildings the company went to much expense in erecting a mining town extraordinary—what might properly be called a model town with all due respect to this adjective, which is at present much abused by overwork. The company desired to attract and retain skilled workmen. Unfortunately, while all arrangements may be made for a large output from a mine located in an isolated region, that output may nevertheless be hard to obtain. The expected tonnage could be obtained only through the erection of such dwellings as the miners would be quick to appreciate. Thus when the houses were built, they were erected of the best materials. Amusement buildings and all other community works that go to make life something more than a mere existence also were erected. Today the town of Mather is possibly the most up-to-date mining community of its size in Pennsylvania.

Other motives, of course, influenced the officials of the company in putting a large amount of capital into the building of such a town. Chief of these was the desire to keep abreast of the times. In these days the science of psychiatry must be studied by the mine foreman and his fellow executives if the needs of discontented workmen are to be discounted. On the whole this is given a tremendous start toward successful application, if the miners go home at the end of their day's work to a cottage or bungalow that is the best, within reason, that money can erect.

Steady Work Is the Chief Desideratum

But all the expense incurred in building the town of Mather, all the care exercised in planning and devising a community and welfare program, will go for nothing if the service of the railroad is not dependable. Even the most unskilled labor cannot be retained in the finest town ever built when work becomes intermittent. It is necessary, therefore, that the mine be assured continuous operation if a desirable class of workmen is to be attracted and retained and the town buildings are to serve the purpose for which they were constructed. Men care nothing for attractive homes or for residence in a community, even if its recreational facilities rival those of a large city, if they are unable to earn a steady wage.

As a consequence, when the railroad situation became acute last winter, something had to be done and done quickly. Trucks could not be pressed into service even temporarily, for the reasons already mentioned. One alternative only remained—namely, to store the coal at the mine.

The Mather mine today operates whether cars are available or not. True, the railroad situation has much improved since last winter, although from the standpoint of efficient service much yet is to be desired. The Mather company officials do not care now whether a steady supply of cars at the mine is maintained. Arrangements have been provided whereby the mine is to a large degree independent of the intermittent service furnished by the common carriers.

For western Pennsylvania the scheme adopted to accomplish this result is a novel one; a plan was adopted, however, that might readily be put into operation by other firms confronted with approximately the same conditions. Some expense is, of course, involved, but this is insignificant when compared with the results obtained. The means and methods adopted by this firm in order to keep its mine in steady operation accordingly will be described briefly.

In the issues of *Coal Age* for Nov. 13 and 20, 1919, I described the surface plant at this operation. At the time of my visit, in the early autumn of that year, the railroads were only just beginning to show the effect of not having purchased a sufficient amount of equipment during the three preceding years. At that time some coal had already been stored on the ground near the surface works, but only such an amount as would permit underground development to keep pace with the building program on the surface. The coal had to be stored until the railroad spur from the Monongahela Division of the Pennsylvania R.R. from Millsboro, on the west bank of the river, had been completed.

No thought at that time had been given to the necessity of providing means whereby steady mine operation could be assured, for, as has been stated, the common carriers of the country were only just beginning to show the effects of their strenuous war-time operation.

Larries Used to Store Coal for Shipment

Rock and refuse from the picking tables are taken from a discharge chute on the side of the tipple and discharged upon a dump by means of a slate larry. When the service of the railroads became inadequate to the needs of the mine, little time was wasted in devising means for keeping the operation running. Additional slate larries were pressed into service, and the entire mine product, cleaned on the tipple as usual (this company does not size its coal, as all of it has to be crushed

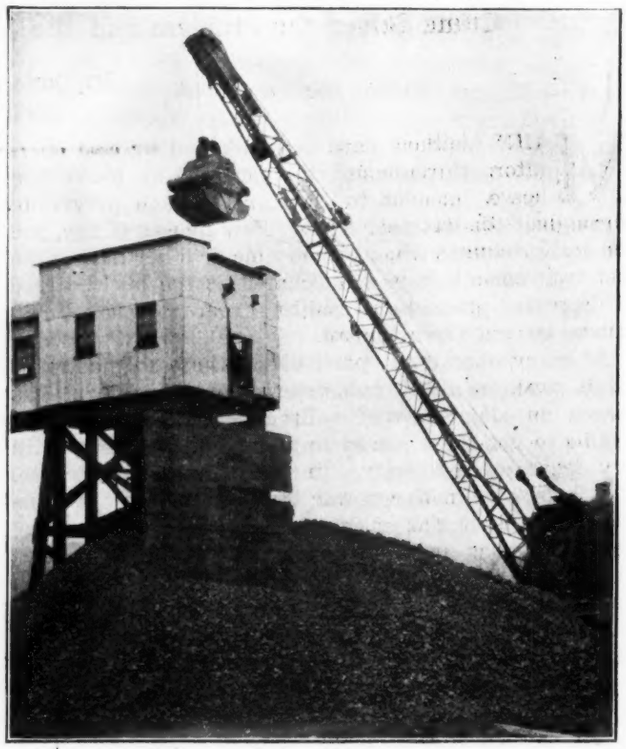


FIG. 1. HOIST STORES AND RECLAIMS THE COAL

The bucket of the locomotive crane, which has a 70-ft. boom and a 1½-ton bucket, is shown over the hopper at the end of the secondary conveyor. It is reclaiming the coal and is about to discharge the bucket, the contents of which will be reconveyed to the bin. The coal thus being handled is the material from the storage piles which were built up whenever the storage bin was filled. At the time of Mr. Baker's visit sufficient cars were available to warrant reclaiming from stock piles.

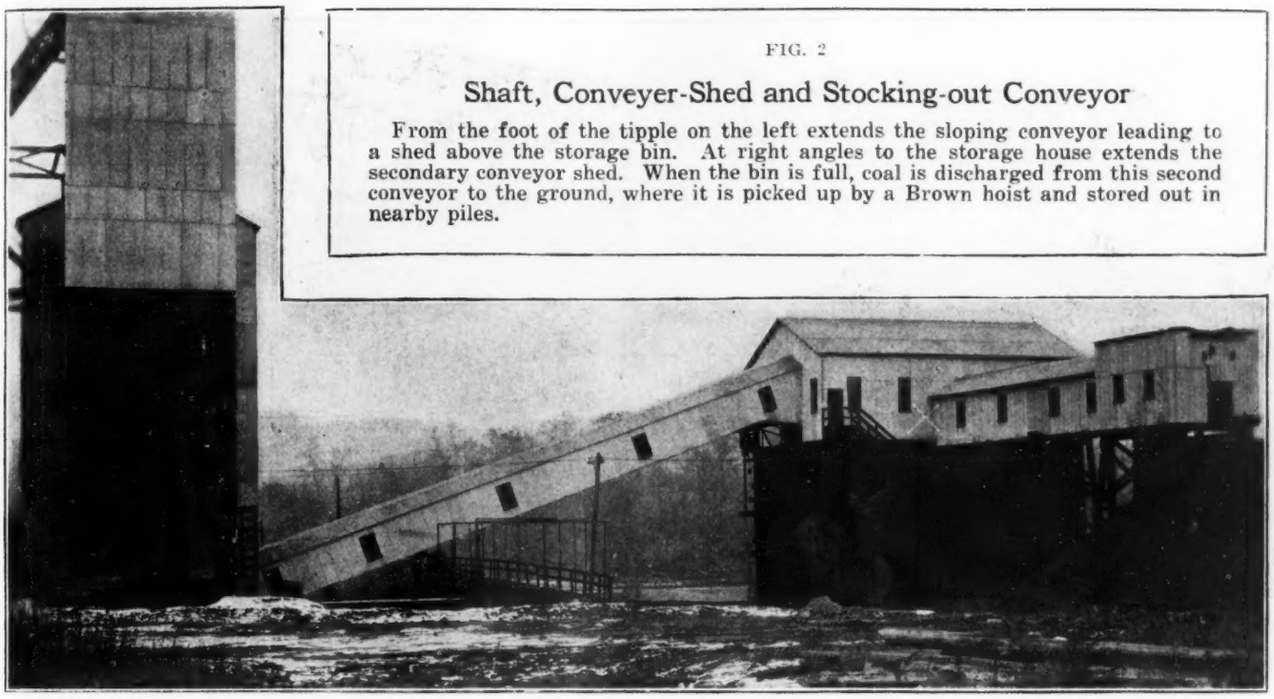


FIG. 2

Shaft, Conveyer-Shed and Stocking-out Conveyor

From the foot of the tipple on the left extends the sloping conveyor leading to a shed above the storage bin. At right angles to the storage house extends the secondary conveyor shed. When the bin is full, coal is discharged from this second conveyor to the ground, where it is picked up by a Brown hoist and stored out in nearby piles.

eventually for coking), was loaded into these slate cars, hauled some distance from the tipple and dumped upon the ground in much the same manner as the slate and other extraneous material, which, however, is unloaded onto another pile near the rear of the building.

In the meantime the designers of the plant, Baton & Elliot, of Pittsburgh, set about designing and laying out a large-capacity storage bin wherein coal might be deposited so that when cars were available the product might be shipped without being rehandled by steam shovel. Before the bin could be completed and the necessary equipment installed therein, approximately 50,000 tons of coal had been dumped on the ground. As this was not piled deeply at any point it spread over a large area.

Not Subject to Spontaneous Combustion

This coal, on account of its slow-weathering qualities, is easier to store than some others, for the dangers of spontaneous combustion are less imminent. No trouble has ever been experienced in the coal piles at this plant and no fires have started, despite the fact that no arrangements have been made for placing the lump in the bottom of the pile, as is sometimes advocated, and no means had to be taken to secure artificial circulation of air through the coal. The material is simply taken from the tipple as a run-of-mine product and dumped. Practically all the large tonnage that has now been piled on the ground by the larries will be eventually removed. Fortunately, when this coal was being stored the mine was not working at the capacity which it is hoped may be reached when full development is attained. If its output then had been as large as it is today the pile might have been many times as large as it now is, for this operation is being groomed to produce eventually 6,000 tons of coal per 8-hr. day.

The storage bin was constructed below the tipple, so that any cars only partly filled could be dropped by gravity to a point beneath the bin and their loading completed. The bin itself is a single large container, no partitions being installed. It is constructed of heavy planking with sides reinforced along their lower edges with structural steel. Inside, interlaced timbers serve to keep the building rigid and free from the harmful effects of vibrations while coal is being discharged into it.

Belt 625 Ft. Long Distributes Coal in Bin

A covered conveyor shed, housing a 36-in. rubber belt, connects the bin to the tipple. This is placed on a 19-deg. slope, and the belt, including the return, is 625 ft. in total length.

Within the storage house the belt, of course, passes directly over the center line of the bin. A mechanical tripper moving on a track shortens or extends the belt length so that the coal may be discharged at any desired point. The return of the belt passes over a tension pulley installed in the conveyor shed. This permits the slack in the belt resulting from movement of the tripper to be immediately absorbed. The conveyor is thus always kept taut. It is needless to say that a belt on a 19-deg. pitch must necessarily be maintained at its most effective tension if it is to deliver coal without the excessive wear and tear arising from backslip of the lump sizes, due to the high angle of obliquity. Nowadays when cars are help up along the line the mine and tipple are as active as if long strings of empties lay on the sidings. The coal is prepared on the tipple just as if it were to be loaded immediately. It is then directed into a chute leading to a hopper, whence it is picked up by the rubber belt after passing over a short steel feeder conveyor. The coal then moves up through the conveyor shed, enters the storage house and is discharged into the bin.

This bin has a capacity of 1,200 tons. This may appear rather small, but the end of the house farthest from the tipple is built so that enlargement is possible. The structure was originally designed to accommodate twice the tonnage that may now be stored. As the mine output increases, the bin will be lengthened by adding 50 ft. increments, each such length increasing the capacity by 1,000 tons. Thus if 150 ft. is added to the bin more than 4,000 tons of coal may be stored. At present the 1,200-ton capacity is just about adequate to accommodate a single day's output of the mine, although the hoisting engine is capable of raising 3,000 tons in

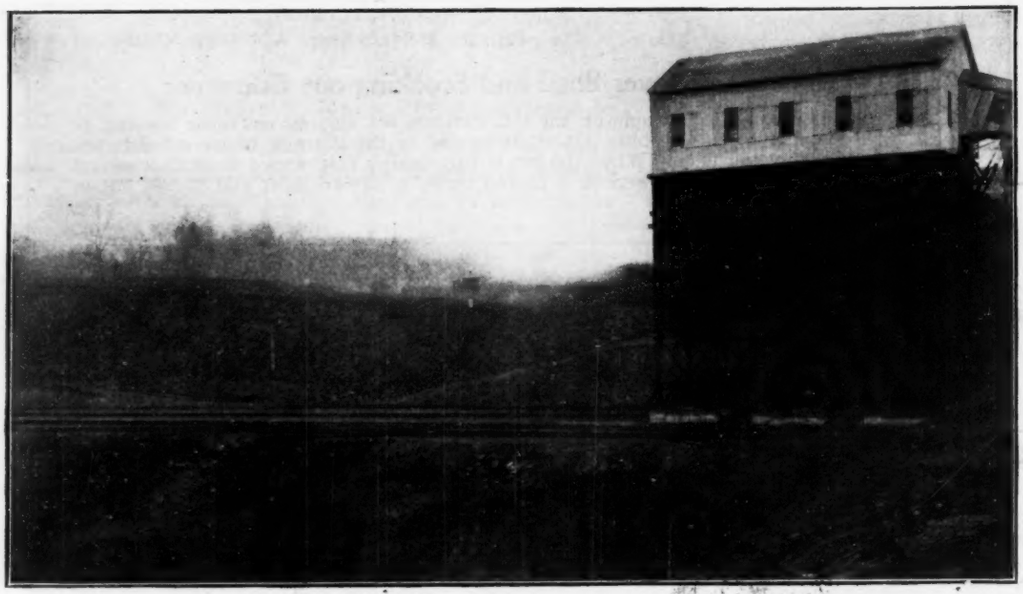


FIG. 3.

Coal Bin and Storage Piles

A cloud of steam is seen at the left of the bin. This is caused by the crane, which is obscured from view. Seventy-five per cent of the coal shown on the ground to the left was placed by electric larries operating from the tipple before the bin had been completed.

eight hours. Thus operation may be carried on for a day without railroad cars.

Longer periods may, however, be expected between car deliveries, and additional facilities are afforded for storing a greater amount of coal. When the bin has been filled, the tripper is held at a point near the head of the incline; the coal is then discharged into a chute feeding a second 36-in. belt extending at right angles to the first and away from the tipple. This belt is 225 ft. long in its entirety. It is so constructed that its motion may readily be reversed.

At the end of this conveyor the coal enters a chute leading to the ground. Here an appreciable drop is encountered, but degradation of the product is a minor consideration, as the coal will eventually be crushed at the coke ovens in Ohio. A Brown hoist equipped with a 70-ft. boom and a 1½-ton clamshell bucket then picks up the coal and piles it near by. For all practical purposes the mine may thus be kept running indefinitely without railroad cars. When cars become available no more coal is directed either into the bin or onto the ground outside, the mine product then being, of course, loaded at the tipple.

It frequently occurs that when cars arrive they come in great abundance. In such case they are filled at both tipple and bin. Two tracks pass beneath the bin and ten hand-operated discharge doors, five above each track, are provided. A full complement of men operating the doors permits a car of coal to be loaded in three minutes. At this rate, the bin contents would soon become exhausted. As a matter of fact, this container is never completely emptied.

It is always desirable to maintain a small amount of coal in the bottom to serve as a cushion for the excessive hammering that results from a full direct descent of the coal. When the bin is nearly emptied, the belt in the rear of the storage house is put in operation in a reverse direction to that employed when transportating coal to the crane. Coal stored out by the Brown hoist is then rehandled by it to a hopper above the rear end of the conveyor. The coal then passes from this hopper, by way of a short steel feeder apron, to the rubber belt. By this means storage on the ground is only temporary, and the material thus treated soon reaches the bins to be loaded out.

Arrangements for storing coal at the mine and rehandling it in large quantity will perhaps be regarded askance by many coal operators of the Pittsburgh district. They are not, however, facing the labor conditions prevailing at Mather. As a matter of fact, only a small fraction of the mine output is thus rehandled at this operation. On Nov. 15 of this year approximately 25,000 tons of coal lay on the ground outside the storage bin, which had been piled there by the crane and eventually would have to be rehandled by it.

The large pile shown in part in Fig. 3, it will be remembered, was built up chiefly by the larries. This coal probably never will be loaded out through the storage bin, as it is planned to load it direct by crane as soon as the car supply becomes normal. As operating conditions now stand, the crane will return to the bin only the coal that it has stored. The larries played their part in the crisis of last winter and will not be again called upon to assure steady production.

Ovens Assured of Steady Fuel Supply

That the surface equipment now installed at Mather is highly flexible no one will doubt. When the various factors influencing its construction are considered, it may be said to be a truly economical installation. Such construction as has here been described, supplementing the tipple, may require the construction of more cars. Such arrangements, nevertheless, tend to assure the ovens of a steady fuel supply.

When the Greene County field becomes such a hive of industry as, say, the Connellsville field now is, labor will not be as scarce or difficult to retain as it is at present, for the region will then be thickly populated. When that time arrives it is safe to assume that the railroads once again will have become efficient, and car shortage being less frequent, storage at the mines will not be so vital a necessity as in the last few months.

However, few can look back and record a time when there was no car shortage. Even when side tracks are full of empty cars and orders for coal are regular, car shortages occur. The mine is scheduled to work on a certain day. The railroad is requisitioned for cars, but, as it has laid off crews, it can only just perform the work demanded of it. For this or some other reason it is late in placing its cars. A wreck may occur or a pulled-out drawbar may delay delivery or the type of car desired may be hard to reach or not on hand. Car

FIG. 4. ANOTHER VIEW OF THE STORED COAL

About 75,000 tons of coal is on the ground adjacent to the storage house, three-quarters of which was placed by larry and will be reclaimed without passing through the bin. This coal is not sized, all the product being run-of-mine. No attempt was made in its storage either to exclude the air or provide abundant ventilation. No heating has been noted.

shortages are common even in dull seasons. In fact, the strings of empties on sidings interfere with railroad operation and the retrenchments of the railroad cause poor tracks and broken-down equipment. For these reasons the service is unsatisfactory.

In good seasons there are always real car shortages, and it is likely that even with moderate business the railroads will from now on be plagued with them. Consequently day-to-day storage or storage for part of a day's run is to be commended, and anyone having a bin, even when operation is more or less regular, will find almost steady use for it.

Some operators in West Virginia districts, isolated to even a greater extent than are the Mather Collieries, might assure their mines of steady production by imitating the example here described. Food for thought at least is furnished by the accomplishment of this Greene County operation.

Nothing Lacking in Loading Machines but Co-operation of Mine Executives

By M. D. Levin
Columbus, Ohio

A LOADING machine that picks up thec oal after it has been undercut and shot down, and loads it into pit cars, is a device that most mine operators desire and have desired for the last twenty years. If the Patent Office records are examined it will be found that hundreds of attempts have been made to produce such a machine. Many of these attempts went no further than the taking out of patents, but on the other hand a number of machines have been built—and good ones, too. Several of these have been well designed, and were capable in some instances of loading a ton or more per minute. But still coal is loaded by hand.

Of course, a good reason for this fact exists, but this is not apparent to most mine operators. It took much money and several years' time for the mining-machine manufacturers to find out why loading machines were not a success. The real reason is that the mine operators will not do their part.

Manufacturers have designed and built loading machines at great expense and have worked out the various details with the utmost care. Many reliable machines are now on the market to choose from, but the average mine operator has done nothing to promote the use of such equipment. He may permit a machine to be put in his mine on trial, but he then pays no more attention to it until the trial period is up, at which time the machine is rejected because it has not loaded enough coal. To emphasize this statement, daily reports covering a loader that is on trial while this article is being written are submitted.

The leader in question is a small, inexpensive machine that does not pick up the coal from the bottom. It is simply a loading conveyor equipped with a scoop that can be operated by means of a manila rope for pulling the coal onto the loading end. The machine weighs about one ton and requires a crew of only two men. The cars hold about two tons of coal.

The following are some of the daily reports:

Oct. 13, 1920—Waited for cars until 1 o'clock. Loaded 14 cars. Loading time 3 hr.

Oct. 14, 1920—Waited for cars until 8:30 a.m. Loaded one car. Moved to another place, and cleaned up slate. Ready to load at 20 min. to 11. Waited 40 min. on cars. Best time to load one car, 3 min. flat. Total cars loaded, 16.

Oct. 15, 1920—Loaded 16 cars today, one by 7:30 a.m. Did not receive any more cars until 10:45 a.m. Total loading time, 3 hr. 30 min. Rest of the time spent waiting for cars.

Oct. 16, 1920—Did not use the loader today, owing to labor shortage. Roof is very tender; we are working in a section that has been idle for more than a year. Have to do our own shooting and have been using inexperienced men who have never worked in a mine before.

Oct. 17, 1920—Sunday.

Oct. 18, 1920—Am sorry, but did not get to use the machine today on account of no men, as men were scarce. Will have some Mexicans tomorrow; they have promised me.

Oct. 19, 1920—Loaded 27 cars today. Received first 8 cars 8:40 a.m. Were loaded out 9:50 a.m. Received next 7 cars 10:20 a.m. Were loaded out 10:55 a.m. Received next 8 cars 12:40 p.m. Received 4 more cars 1:40 p.m. Were loaded out 3 p.m.

Oct. 20, 1920—We had to handle slate most of the day. Loaded 3 cars, 8:30 to 9:15 a.m. Waited for place to move to until 1:45 p.m. Loaded 12 cars by 3 p.m.

Oct. 21, 1920—Received 6 cars 8:30 a.m.; 10 a.m. moved to another section of mine where height is 37 in. Place ready to load 1 p.m. Loaded 8 cars by 2:30 p.m. Waited 30 min. for cars. Loaded 4 cars 3:30 p.m. Total, 18 cars.

Oct. 22, 1920—Started loading at 7:30 a.m. Power off 30 min. Loaded 4 cars by 8:45 a.m. Waited until 10 a.m. for car and timbers. Loaded 1 car. Moved and shot next room. Started loading 12 noon; thirteen cars loaded by 2:30 p.m. Moved to another place where there was no track. We have the loader in extremely low places and have to lower the track in every new place. The switches to the entries are laid on large ties and we have to lower them from 1 to 3 in. Total cars loaded, 18.

Oct. 23, 1920—No rooms cut today.

Oct. 24, 1920—Sunday.

Oct. 25, 1920—One one narrow place cut today; this gave about 11 tons. We loaded this place in about 1 hr. 19 min. There was a loader in a place directly across from us that was fully 8 hr. loading his place out, and he is an exceptionally good man.

The report of Oct. 25 was supplemented in a letter written by a party who was present while the place was loaded. He writes as follows:

The machine was in the place 1 hr. 19 min. However, the actual running time was 21 min., the rest of the time being used in waiting on cars and digging up heavy bottom left by the machine men. The demonstrator is working hard to make it go; in fact, is doing most of it himself, as they have given him a Mexican for a helper, who cannot speak a word of English. This indicates that the man who runs the loader is quite modest in his reports. It also shows that the machine can load coal rapidly.

The officials of this coal company seemed to be enthusiastic and kept on writing and telegraphing in order to get a loading machine to the mine at an early date. The manufacturers were somewhat delayed in keeping their promise because some slight changes had to be made in the truck in order to accommodate the machine to the low coal. When the machine arrived at the mine, however, it was left standing on the surface for many weeks, and probably would not have been put in the mine at all if a demonstrator had not been sent out to attend to it.

Lack of Interest Hinders Success

No doubt the officials of this mine think that they are being fair with the machine and that they are doing everything reasonable to make it a success. Any intelligent man reading the report, however, will realize that no matter what kind of a machine was used, even if it was the most ideal possible, it would be a failure. The object of this article is to bring this fact home. Many manufacturers have done their part, but most mine operators will do nothing. And as long as these conditions exist, coal will be loaded in the old-fashioned way—by shovel.

The small, inexpensive machine, requiring a crew of only two men, used in this particular mine demands little preparation as compared with a large, expensive device that picks up the coal from the floor and requires at least ten or perhaps more men to perform the various operations necessary in connection with it. It should be a simple matter to prepare a mine for the small loader in question, but if this is not done, it is out of the question to attempt to use larger and more expensive loading devices.

The following are the conclusions to be drawn from actual experience with loading machines:

It is a simple matter to build a reliable loader that will handle coal rapidly. Such machines of various types have been constructed, but have not been found profitable, for the following reasons:

(1) No means have so far been devised to provide an uninterrupted supply of pit cars to a loading machine that has to be moved from one place to another.

(2) In most mines the coal cannot be shot down so that the loading machine can handle it. The coal must be pulled down from the face by hand; this operation seriously delays the machine.

(3) A loading machine that is strong enough to be reliable and capable of picking up coal and loading it into pit cars is too heavy and cumbersome to move rapidly from one place to another.

(4) A loading machine performs only a small part of the work necessary to coal production. Such operations as undercutting, drilling, shooting, pulling down the coal from the face and breaking it up into lumps of suitable size, squaring and cleaning up rooms, setting props, handling slate, taking up bottom, and laying track, must be done by hand. It has been found that to perform this work successfully as well as that of handling cars and runing the loading machine, requires a crew of no less than ten men, and sometimes as many as twenty, depending upon conditions.

Experiments Taught Costly Lessons

Some mining-machine manufacturers learned their lesson years ago and declined to furnish loading machines that would pick up coal from the bottom. Mine operators still insisted that they needed such machines, and many of them went to work and built them themselves. They kept on for a few years, building and experimenting, until it hurt their pocketbooks too severely—then they stopped. Others are still at it.

It is highly probable that millions of dollars have been expended on coal-loading machines during the last ten years, and so far as I am aware, little has been accomplished.

Machine to Pick Up Coal Cannot Be Light

A machine that picks up coal from the bottom and delivers it into mine cars is necessarily heavy and expensive. Some picking-up mechanism must be provided that can be moved along the face to gather the coal. Conveyors must be provided that will carry the material to the car regardless of the position of the gathering device. In most machines two conveyors are employed for this purpose. It appears that such a device must remain in the same place for an appreciable length of time if it is to be financially successful. Only two ways of accomplishing this are apparent; one is to so alter the prevailing system of mining that the loading machine can work along a face of considerable length; the other is to maintain the present room-and-pillar system of mining and use a machine that mines the coal as well as loads it, thus allowing it to remain in one room until it is worked out, or in a single entry until this has been driven as far as desired.

Preparation Must Be Made for Machine

A small machine of the type mentioned above—that is, simply a plain conveyor—can be used to advantage in room-and-pillar work, as this device is light and convenient to move from one place to another. The crew is small, and delays, such as waiting for cars, are not particularly serious. At such times the men have other things to do—for instance, pulling the coal down from the face and getting it ready for loading. But even with such a machine preparations must be made for it. Places must be cut, drilled and shot; suitable arrangements made for storing cars, and the work laid out in a systematic manner. This cannot be done unless a section of the mine be set apart and enough loading machines installed to keep an undercutter busy, as well as a gathering locomotive or two. The undercutting, shooting, loading, timbering, etc., can then be arranged systematically.

New Features in Cutters Make Them Adaptable and Easy to Load and Unload

Automatic Friction-Actuated Cable-Carrying Trailer and Tilting Swiveling Guides That Facilitate Unloading and Reloading Are the Chief of Many Improvements to the Standard Machine—Low-Vein Model Is a Combination Shortwall and Longwall Undercutter Possessing the Advantages of Both Types

By S. B. King
Chicago, Ill.

More than twenty years have elapsed since the continuous type of coal-cutting machine was developed and placed on the market. In these two decades many improvements in design and construction have been made, all tending toward safer, more rapid and less expensive coal production. Within the last year improvements have been made in "Ironclad" machines of this type to such number and extent as to justify the presentation of this article.

While the basic principles of design and construction have not been altered, numerous modifications have been made, each tending toward increased safety to the machine runner, greater convenience or a lessening of operating expense. Chief among these has been the introduction of new types of self-propelling trucks or carriages upon which the machines are mounted.

A Tilting Truck Makes Unloading Easy

To meet ordinary mining conditions a drop-front truck is now supplied. In this the forward portion tilts downward and thus acts as a skidway or inclined plane over which the machine moves upward or downward, sliding easily and without jar to or from the floor of the room. In reloading, this device saves much time. In either operation, however, the main portion of the truck and all four wheels remain upon the track.

As may be noted from the frontispiece, ample space has been provided at the rear of the truck for the operator's platform. Here also is situated the control mechanism (see Fig. 4), consisting of a friction drive and a brake of liberal dimensions giving prompt and close control of the machine when moving from place to place.

On all Sullivan mining-machine trucks except the "Tipturn" (described later) the trailing cable through which current is supplied is carried on a separate car or trailer connected to the main truck by a draw bar. In Figs. 1, 5 and 6 it will be noted that this trailer has a separate frame and four supporting wheels, thus forming practically an independent unit.

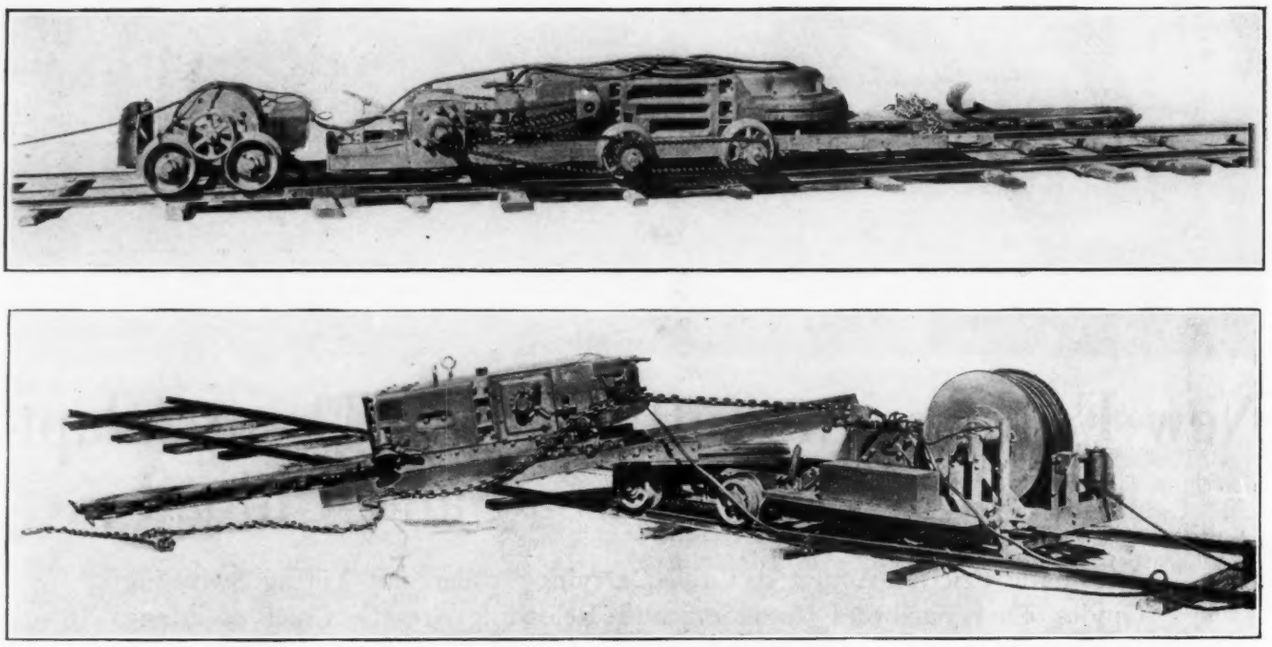
A guide consisting of horizontal and vertical rollers is placed at the rear, through which the cable is paid out or taken in. This insures even spooling. As upon earlier models, a self-winding feature is provided. The small wheels, one at either end of the spool shaft, receive their motion by friction from the wheels of the truck which support them. Current is led to the machine through revolving contacts as the cable is paid out or wound in.

Truck Swivels Placing Cutter as Desired

These trailer reels are arranged for either alternating or direct current. When they are to be used in a gaseous mine, they may be equipped with explosion-proof cable plugs. A tool box is mounted on the forward end of the trailer.

For coal 48 in. high or more, the "Class G" or Tipturn truck is available. This affords increased convenience and efficiency in handling the machine. As the name suggests, this truck is of a tilting and swiveled pattern. It is illustrated in Figs. 2 and 3. When in the traveling position the machine rests upon two superimposed circular plates constituting a swivel or turntable. As the coal cutter is fed forward upon the truck in unloading, the operator swings it by hand until it points in the desired direction. The forward portion of the truck then tilts downward, and the machine unloads as does the ordinary truck. It may, of course, be reloaded in a similar manner.

As the Tipturn will unload at any angle to the track up to 45 deg., it is evident that when the machine reaches the floor of the mine it is headed in the desired direction and will haul itself to the sumping point with the fewest possible settings of jacks or rearrangements of feed chain. The trailing cable on this truck is carried on a reel of large diameter mounted on the



FIGS. 1 AND 2. LOW-VEIN CUTTING MACHINE ON SELF-PROPELLING TRUCK AND STANDARD-SIZE MACHINE RELOADING ON TIPTURN TRUCK

The low-vein machine is less than 18-in. high when unloaded and under 2 ft. high when on the truck. Note in the lower illustration how readily the cutting machine is shifted to the truck and pulled up the incline into place. At most mines, unfortunately, all machines have to be taken from room to room and there unloaded and reloaded. Ability to travel at 275 ft. per min. and load and unload at maximum speed and minimum labor helps to overcome the drawback of room-and-pillar operation.

rear of the truck itself, equipped with guide and arranged for self-winding. The machine will thus pick up its own cable whether in motion or standing still. This is frequently a convenience when reloading.

Friction drive and brake also are provided, as in the standard truck, and the control is so accurate and close that the machine may be moved at a speed of only a few inches per minute when crossing bad switch points or traversing poorly laid sections of track. On the other hand, it may be made to move as rapidly as 275 ft. per min. over smooth roads. These trucks are substantially and sturdily built. In a mine in Utah where the coal is considered "hard cutting" and where four to five places a day have been thought excellent performance the greater speed and convenience of the Tipturn truck has enabled the machine to cut, day after day, fourteen or fifteen places per 8-hour shift.

The cutting machines themselves also have been improved in various details. All motors used upon these machines, whether equipped with direct- or alternating-current motors, or with air turbines, are now provided with roller bearings throughout. An improved type of controller has been placed in service which is more convenient and more durable than earlier models.

Clutch Prevents Chain Moving When on Truck

A new automatically locking handle is now furnished for the cutter-chain clutch. This renders it impossible for accidental engagement of the clutch and consequent starting of the cutter chain while the machine is loaded upon its truck and moving along the track to take place. This in itself greatly increases the safety of the operator.

The adjustment of the driving friction which controls and protects the feed gearing is sealed so that after proper setting has once been made in conformity with the pull necessary to cut the coal it cannot be tampered with. Damage to working parts is thus obviated.

Of secondary importance but a device of great convenience and increased safety is the clip for drawing current from the trolley wire when moving from place to place. This clip is provided with an insulated handle and a renewable fuse plug. This clip and handle comply with the mining laws of the State of Pennsylvania and are proving highly popular among mine operators and machine runners in that commonwealth and elsewhere.

Another apparently minor detail but one of great importance in the economical and effective operation of the machine is the introduction of a centrifugal drop-by-drop oiler, by means of which the main driving gears are lubricated. A hollow shaft is an essential part of this device.

Only Seventeen Inches High when Cutting

In certain sections of the country an insistent demand for coal has resulted in the opening of mines in beds much thinner than those usually worked. For coal two feet or less in thickness the ordinary mining machine stands too high, entailing delay and expense in lifting bottom or brushing top. In designing a machine for operation in such coal beds, engineers naturally looked to the longwall field for inspiration. Here thin beds are the rule rather than the exception.

The Sullivan longwall machine accordingly has been adapted to room-and-pillar work and is now known as the "CE-9 Ironclad." The direct-current low-vein machine thus developed is only 17 in. high when cutting, and 23½ in. high when loaded upon its drop-axle power truck. This is 6 in. less than the height of the standard undercutter. The alternating-current machine of the same type is ⅜ in. higher when cutting and ⅞ in. higher when loaded for moving.

The low-vein Ironclad embodies the same general construction and design as the longwall machine, but the cutter bar is locked in a position parallel with the body, and moves across the face in the same manner as does the shortwall machine. A detachable swing arm may be fastened to the forward end of the cutter bar.

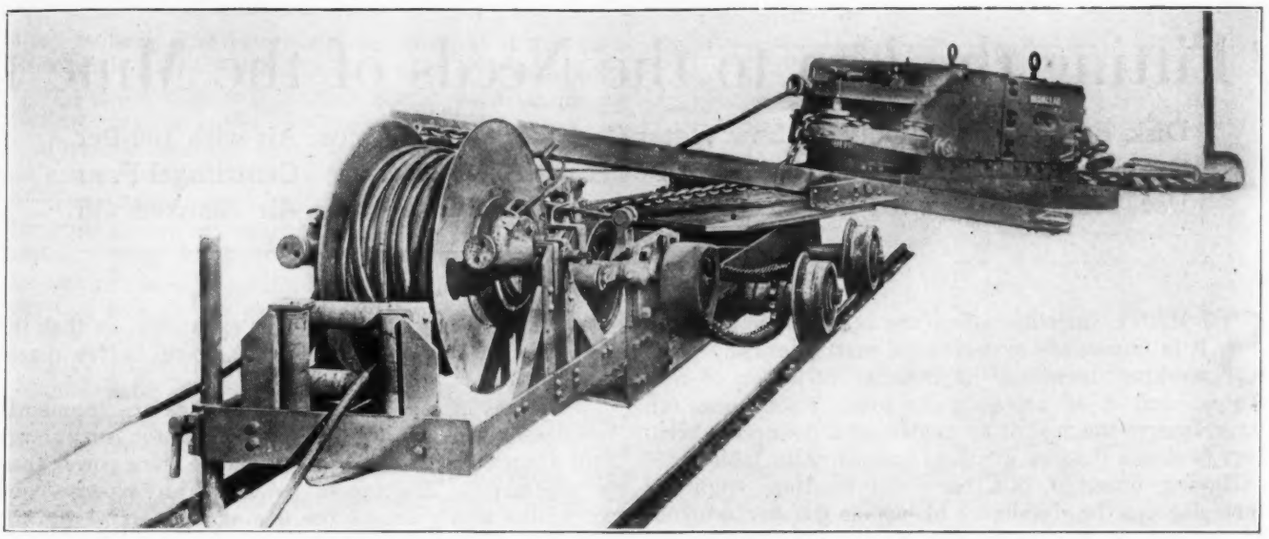


FIG. 3. UNLOADING CUTTING MACHINE FROM TRUCK; VIEW FROM REAR

In Tipturn trucks the trailing cable is carried on the rear of the truck, from which it is played out through a framework carrying four rollers, two horizontal and two vertical. The operator can swing the Tipturn at an angle of 45 deg. to the truck and for this reason it is possible to place the machine so that it will haul itself to the sumping point with a minimum of jack settings and rearrangements of chain lead. The rapid placing of the machine adds much to its capacity.

This machine is light, strong and compact, and embodies the combined advantages of the room-and-pillar and longwall cutters. It can be reversed so as to cut in a direction opposite to normal. This is done by shifting the swing arm to the opposite side of the body, resetting the cutter bits, rearranging the feed-chain and reversing the motor. Cutter bars up to 6½ ft. in length can be furnished.

This machine can be converted into a longwall type by removing the swing arm and, after sumping, locking the cutter bar at right angles to the body. This convertibility is a valuable detail, as by its use the low-vein machine may be employed as a room-and-pillar undercutter for development work, entry driving, cross cutting, etc., or as a longwall machine when faces of sufficient length have been developed.

Improvements previously mentioned as applying to the standard Ironclad are embodied in those of the low-vein type. The controller is of the dial model and is completely inclosed within the frame of the machine. The contacts are mounted upon an asbestos base. The reverse switch is interlocking, so that it cannot be thrown until the handle of the controller is in the "off" position.

A self-propelling truck is provided for the low-vein machine. This may be fitted with either straight or drop axles. The drive is by means of friction clutch, while upon heavy grades a hand brake controls the movement. The truck is operated by the driving motor of the machine through a reduction gear, and a speed along the track of 250 ft. per min. is attainable.

A drop front also is furnished upon this truck, and the cable, as will be noticed in Fig. 1, is carried upon a four-wheel trailer, thus insuring long life. Current passes through revolving contacts as the cable is paid out or drawn in. Reeling is automatic, the reel being actuated by the friction rollers which engage the four wheels of the trailer in the manner already described.

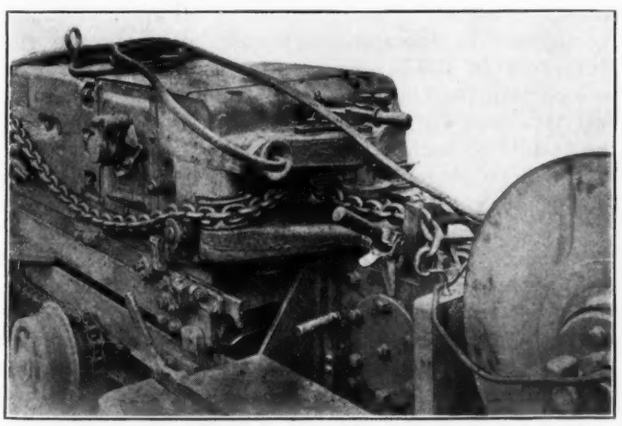
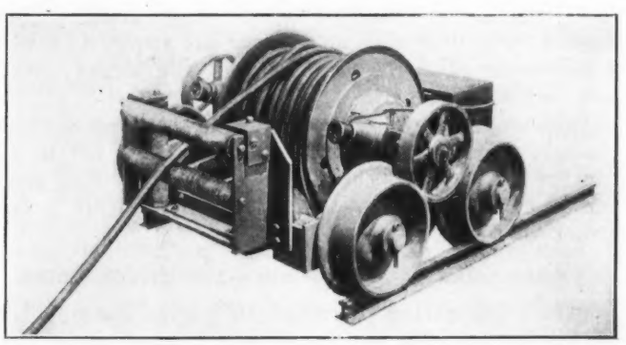
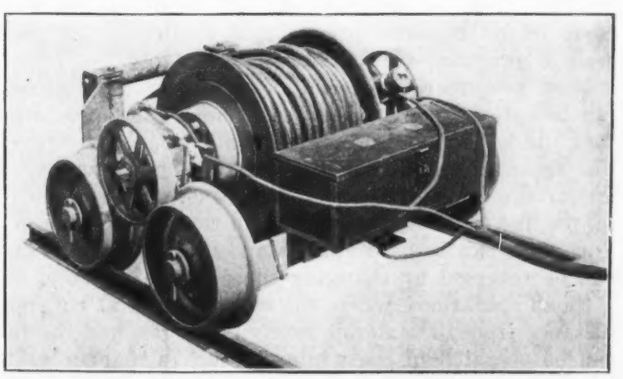


FIG. 4. DETAIL OF CONTROL LEVER ON TIPTURN TRUCK

A friction drive and an adequate brake make it possible to control the machine satisfactorily when moving from place to place over heavy grades and tracks where derailments are to be feared.





FIGS. 5 AND 6. CUTTING MACHINE TRAILER REELS

Trailer is shown in these illustrations from both front and rear. The spool is carried upon and receives motion from a roller on either end that rests upon and is actuated by the track wheels.

Fitting the Fan to the Needs of the Mine*

Disk Fan Is Suited Only to Low Water Gage—It Delivers Most Air with 100-Per Cent Ratio of Opening and Uses Most Power with Zero Opening—Centrifugal Fans Use Most Power with 100-Per Cent Opening and Least with Air Blanked Off

BY THOMAS CHESTER
Pittsburgh, Pa.

SO MANY variables affect the action of a fan that it is impossible to determine mathematically from working drawings the capacity of a fan of new design, and it is necessary to make tests either on large fans in the field or on models in a research laboratory to obtain data on which to base capacity tables.

Having obtained this basic information, empirical formulas can be developed by which the performance of any size of fan under any required conditions can be determined, providing only that no change is made in the design. Manufacturers who understand this fact make their fans geometrically similar, as this results in a close uniformity of action throughout the complete range of sizes.

Even with no change in design, however, the efficiency of a large fan is higher than that of a small one because the lower internal resistance or skin friction thus resulting leaves more energy for useful work outside the fan. This will be clearly understood when it is recalled that the rubbing surface within a fan increases directly as the diameter of the impeller, while all the areas increase as the square of the diameter.

To illustrate this, compare the throats or outlets of two fans, both of modern type, one having an impeller 1 ft. 6 in. in diameter and the other an impeller of which the diameter is 15 ft. The ratio between them will be as 1: 10. The outlets will be about one foot square and ten feet square respectively. The smaller outlet will have an area of one square foot and a perimeter of 4 ft. The area of the larger outlet will be 100 sq.ft. with a perimeter of 40 ft.

The ratio of area to perimeter or rubbing surface changes from 1 to 4 for the small fan to 100 to 40 for the large fan. The same comparison holds good for all channels through which air flows within a fan either in the housing or impeller.

CONFINE DISK FANS TO LOW-GAGE VENTILATION

Before submitting characteristic curves showing the performance of disk and centrifugal fans of well-known designs, from an entirely shut-off condition to wide open, let us consider the general application of fans from a practical viewpoint.

Most new operations, whether shaft or drift mines, can be satisfactorily ventilated by disk fans, providing that the water gage or mine resistance to the flow of the required volume of air does not much exceed ½ in. for the cheaper makes of fans and, say, 1 in. to 1¼ in. for disk fans of substantial and rugged construction. Such fans can be used as blowers or as exhausters and can be reversed by changing the direction of rotation.

Small operations, where the workings are at no great distance from the outcrop, rarely make gas, and the fan can be operated in the winter in such a manner as to provide warm air for the miners. This is done by operating the fan as a blower or exhauster, so that the air will have the longest leg of its travel before reaching the men.

Disk fans of an excessively large size are frequently installed. This is a mistaken policy, for such large fans are not efficient and they consume more power than is necessary. The excess power is an expense, and the undue load shortens the life of the fan.

The characteristics of disk and centrifugal fans are directly opposite. Each type is subject to the laws governing the operation of fans of that class, and this is true regardless of the particular make or design of fan that may be installed. When running at a constant speed, a disk fan delivers the most air and uses the least power when the static pressure is nothing. In fan research work this condition is termed 100-per cent ratio of opening.

The maximum power is consumed when the airway or duct is stopped off entirely, and this is the condition designated as zero opening. Under this condition all the power applied to the fan is used in churning air. It will be realized, therefore, that when a disk fan of too large a size is used, the operating condition is closer to zero ratio of opening than is desirable and power is wasted in churning.

CENTRIFUGAL USES MOST POWER WHEN WIDE OPEN

A centrifugal fan uses the most power at 100-per cent ratio of opening and the least at zero opening, when the airway is blanked off entirely. The capacity tables of Ventura disk mine fans are made up on the basis of 50-per cent ratio of opening. A fan is attached to a straight pipe or duct of about the same diameter as the fan wheel, or impeller, while the farther end of the duct is provided with an opening having an area 50 per cent less than the cross-sectional area of the duct.

Under this condition tests are run and the relations between fan speeds, air volumes handled and power consumptions are noted and compiled in the form of capacity tables. In research work complete tests are run from zero to 100-per cent ratio of opening in order to ascertain the characteristics of the fan, so that the best type may be developed. Fig. 1 shows graphically the results of such a test on a Ventura mine fan.

It will be obvious that if tests were run at higher than 50-per cent ratio of opening the volumetric capacities would be higher because the larger opening at the end of the test pipe would permit more air to flow at any given fan speed. The effect, however, would be to lower the mechanical efficiency. On an inspection of the efficiency curve it will be noted that the efficiency falls off when the ratio of opening is either greater or less than 50 per cent.

This means that if the fan is either too large or too small the power used will be greater than necessary. It must be borne in mind that 50-per cent ratio of opening does not mean 50 per cent of the mine equiv-

*Article, entitled "Mine Fans," read before the Coal Mining Institute of America at its annual meeting, held Dec. 9, 1920, in Pittsburgh, Pa.

alent orifice. The two would be identical if fan tests were made in a large chamber, so that air could escape from the outlet in such manner that it would commence to flow near the outlet at almost no velocity.

Murgue's formula, which incidentally is like the law of gravity in that it is as true today as when it was first expounded, contemplates air commencing to flow through an orifice from a theoretically stationary condition. With relatively small ducts, such as are used in testing fans, the actual opening at the far end of the test pipe checks closely with the equivalent orifices at low ratios of opening. This is because the air velocity within the test duct is then fairly low.

As a safe rule wherewith to check the size of a Ventura disk fan it can be stated that the area of the fan impeller should be between 1.28 and 1.4 times the area of the mine equivalent orifice. Fifty-per cent ratio of opening checks closely with a fan having an impeller approximately 1.28 times the mine equivalent orifice. It must be understood this rule applies only to Ventura mine fans.

Booster Fans Cut Out Regulation Losses

Motor-driven fans are much used today for auxiliary underground ventilation, as they provide a satisfactory air movement in outlying sections without it being necessary to interpose resistances for the regulation of the air, which resistances inevitably increase the water gage of the whole mine. Either disk or centrifugal fans can be employed for this work, the use of the former being limited to places where not more than 1 in. of water gage is needed.

Present practice in the Pocahontas field is to cut out centrally-placed centrifugal fans working at medium to high water gages and make use of a number of disk fans, each serving its own territory. This is a satisfactory plan, as the water gage can be kept down to about 1 in. with consequent low power consumption.

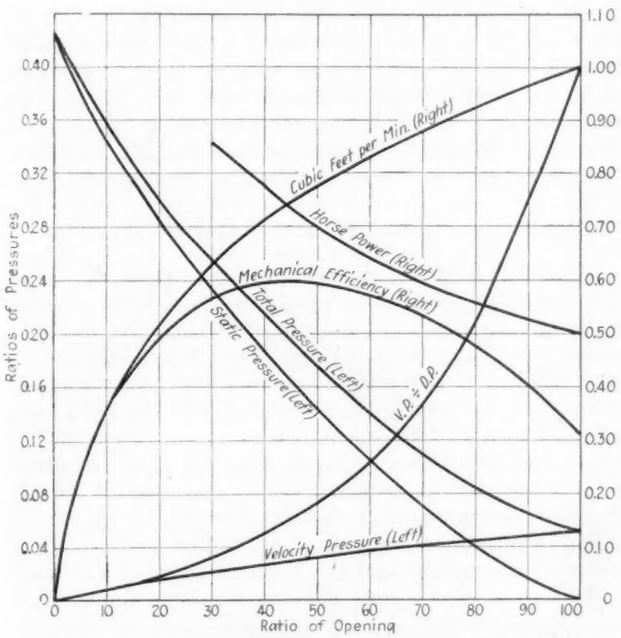


FIG. 1. CHARACTERISTICS OF THE VENTURA DISK MINE FAN—BLOWING

Mechanical efficiency is greatest when the ratio of opening lies between 40 and 50 per cent of the throat opening. The horsepower needed to drive the fan is reduced as the ratio of opening approaches 100 per cent and increases as the opening ratio is decreased. Note how the static and total pressures decline as the ratio of opening is increased.

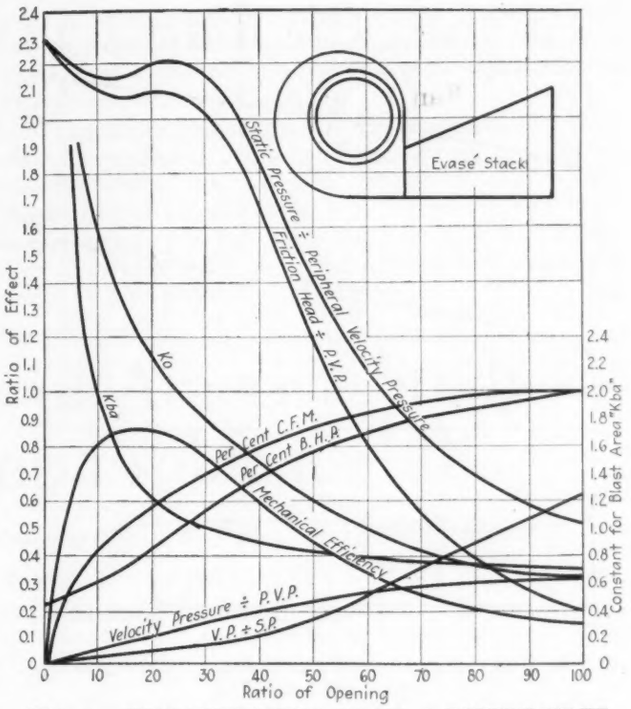


FIG. 2. CHARACTERISTICS OF NO. 8 DOUBLE-INLET SIROCCO EXHAUSTER FAN WITH EVASÉ STACK

In this graph the ratio of opening is based on full inlet area, the outlet is wide open and the inlet only restricted. It should be noted that this is a laboratory test and therefore has been extended both ways beyond the ordinary limits of application, which lie between 10 and 30 per cent where a reasonably equal mechanical efficiency is obtained.

Disk fans can be used in series, that is to say, a supply fan can be used for about 1 in. water gage and an exhauster fan for a similar amount, giving a total operating head of 2 in. of water gage. This arrangement may do well for temporary use, but is not recommended for permanent work, because, by reason of the higher efficiency of a centrifugal fan, that form of ventilator could be employed to better advantage.

Volumetric Efficiency Now Volumetric Ratio

The development of the multiblade centrifugal style of ventilator has naturally thrown into the discard most of the old theories about fan performances. The term "volumetric efficiency" formerly was used to denote the number of times a fan impeller could clear itself of air per revolution. One clearance for each complete turn of the fan was considered as being 100 per cent volumetric efficiency, and old-style fans did well if they approached this performance.

With shallow, curved blades forwardly inclined in the direction of rotation it is easily possible for a modern fan impeller to clear itself two and one-half to three times per revolution. As any expression in excess of 100 per cent is absurd when used to denote efficiency, the term should be changed to "volumetric ratio" and be given in digits and decimals instead of as a percentage. Thus the ordinary volumetric ratio would be from 2.5 to 3.0.

The acid test of any fan, however, is its mechanical efficiency, which is a comparison of the useful work done by a fan in relation to the power used to drive it. It is easily possible to obtain efficiencies from 70 per cent to 80 per cent with multiblade fans of modern design. I recently sold a fan under a mechanical-efficiency guarantee of 75 per cent with an energy con-

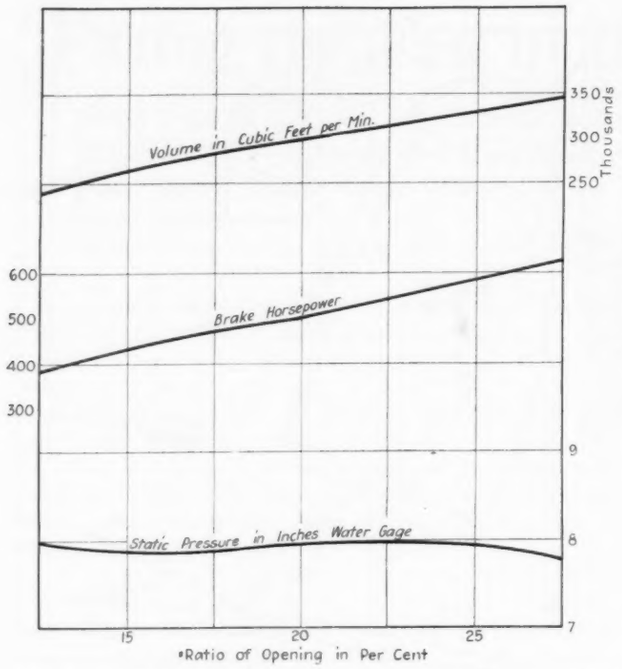


FIG. 3. CURVES SHOWING PERFORMANCE OF DOUBLE-INLET SIROCCO FAN

Impeller measures 9 feet 6 in. in diameter by 4 ft. 9 in. wide. Duty, 300,000 cu.ft. per min., 8-in. water gage.

sumption of 820 hp. A difference of 5 per cent in efficiency in this case involves 41 hp., and at, say, $150 per annum for 24 hours' service this is equivalent to $6,150 in yearly operating cost.

The matter of correct fan design is, therefore, of great importance. Moreover, the side drifts leading to the fan should be carefully designed so as to minimize friction as far as possible. For the same reason it is clearly worth while to provide an easy bend at the point where the mine airshaft connects with the fan side drifts.

Characteristic Curve for Sirocco Fan

Fig. 2 shows characteristic curves for a Sirocco mine fan. These have been developed in the same manner as those for disk fans. Although this chart gives the performance of the fan from 100 per cent open to zero opening, the actual scope is from 20 to 30 per cent ratio of opening. The majority of installations are figured so that the fans will be working at around 25-per cent opening, which makes it easy to guarantee 75-per cent mechanical efficiency, as that figure has a sufficient margin of safety.

The size of a fan is decreased if it is figured at a higher ratio of opening, and conversely the size is greater when the ratio of opening is lower. The mechanical efficiency drops off rapidly above 25 per cent ratio of opening, and this makes it inadvisable to select a fan of so small a size that a larger ratio of opening may have to be used.

On the other hand, if, by figuring a larger fan, the ratio of opening is decreased below 25 per cent, as shown by the chart, the first cost is considerably increased, and only the most progressive operators select ventilating equipment on the basis of the lowest ultimate cost.

The minimum size of Sirocco fan which can be used for any given requirement can be determined by multiplying the mine equivalent orifice by 1.5. This gives the area of a circle the diameter of which is the diameter of the fan impeller. A larger fan than denoted by this formula could be used and would have a lower power consumption, but the rule given represents average practice.

Fig. 3 shows the variation in performance of a fan between 27.5 per cent and 12.5 per cent ratio of opening, the fan under consideration being figured at approximately 20-per cent ratio of opening for a contract duty of 300,000 cu.ft. of air per min. against 8 in. of water gage with a mechanical efficiency not lower than 75 per cent.

The mine to which a fan is applied governs the static pressure by the resistance it offers to the flow of a given volume of air per minute. The above curves indicate that the fan referred to is capable of handling large changes in volume with little change in static pressure.

Over-Large or Over-Small Fans Alike Bad

It is not necessary, however, to provide much reserve power, as the ability of the fan to handle an increased volume of air against a certain water gage is safely held in check by the mine resistance, which increases as the square of the volume. This is only true, of course, providing the probable mine resistance has been carefully calculated or has been accurately ascertained from information available in regard to the performances of an existing fan.

The curves given in this article are submitted to show how the mechanical efficiency varies in accord with the size of the fan selected to perform any given duty. If the fan is made too small its internal friction is too great because of the high velocity with which the air must pass through it.

On the other hand, if the fan is too large or of incorrect proportions, its efficiency is lowered because air will regurgitate, or recirculate, through the less active portions of the fan blades.

All centrifugal fans operate in accordance with Newton's law of motion, which states that a moving body travels with uniform velocity in a straight line except in so far as it is made to change that state by external forces. Air issues from the periphery of a fan impeller because of this tendency to move in a straight line, while the fan blades are forced to follow a circular path.

Peripheral Velocity and Ratio of Opening

With the same peripheral speed a particle of air on the tip of a fan blade moves as far away from a tangent in a given time for a small impeller as for a large one. This rate of departure from travel in a straight line is responsible for air being projected with a force proportional to the peripheral velocity, but is also affected by the ratio of fan opening as shown by the characteristic curves. Also the amount of air delivered against a certain resistance per square foot of circumferential area of a fan impeller is the same for either a large or small fan, providing the peripheral velocity is constant and the ratio of opening the same.

Because of this it is an easy matter for a fan engineer to determine the size of impeller required for any specified duty, providing he is fully aware of the characteristics of the fan he handles. If he does not have this information, the fan probably will be selected in the old haphazard way. Any given mine, if maximum efficiency is to be attained, requires a certain size of

fan and no other. The mine has a definite equivalent orifice as determined by Murgue's formula: *E. O. in sq.ft.* = 0.0004 × *number of cu.ft. per min.* ÷ $\sqrt{W. G.}$

Regardless of the make or design of fan used, the size should be selected so that its internal areas bear the correct ratios to the area of the mine equivalent orifice. If two mines are to be ventilated and each requires 100,000 cu.ft. of air per min., the resistances being 1 in. in one case and 2 in. in the other, the mine having the smaller water gage should be equipped with a considerably larger fan.

For a given volume of air handled per minute the lower the water gage, the larger the fan should be. This is because the air velocity within the fan should bear a constant ratio to the square root of the mine water gage if the fan is to operate with equal mechanical efficiency.

In conclusion the recommendation is made that anyone who wishes to understand this subject as fully as possible should gain a clear comprehension of the theory of the equivalent orifice. He should also thoroughly grasp the fact that the size of a fan should bear a definite relation to the area of the equivalent orifice of the mine.

Coal Mining Institute of America Studies Present-Day Mining Problems—II*

Is the Thick Freeport the Upper Freeport and a Rider or the Upper and Lower Freeport with Interval Missing?—Institute Visits Jones & Laughlin Byproduct Plant, Which Uses Unmixed Pittsburgh-District Coal

BY R. DAWSON HALL
New York City

AT THE CLOSE of the discussion of the paper on the microscopic examination of coal by Reinhardt Thiessen, during the afternoon of Dec. 9, William Affelder, general manager of the Hillman Coal & Coke Co., took the chair and introduced:

Question 9. Is the so-called "Thick Freeport Coal" a combination of the Upper and Lower Freeport beds or an abnormal development of the Upper Freeport?

Mr. Affelder said that the proven area of Thick Freeport bed covered in all 75,000 acres. The main bed lay to the west of the Allegheny River, but there also were two small isolated areas, one near Wilmerding and the other near Saltsburg. The ordinary Upper Freeport bed ran from 40 to 44 in., whereas the Thick Freeport was from 5 to 9 ft. thick and even in some places was slightly thicker. He contended that the Thick Freeport was not the result of the coming together of the two Freeports but was an abnormal development of the upper measure.

He stated that along the river bank for many miles the seams of coal had been made continuously visible by a railroad cut. There was nothing to show that the Lower Freeport climbed up the 55 ft. which under ordinary conditions separated it from the Upper Freeport, and he added that as the Upper Freeport limestone was found below the Thick Freeport and was located normally between the Upper and Lower Freeports, we had to assume either that the horizon of the Lower Freeport had crossed the horizon of the Upper Freeport limestone—a physical impossibility—or else we must admit with Mr. Affelder that the Thick Freeport could not by any possibility have resulted from a close approch of the Lower Freeport bed to the Upper Freeport. (Of course there are some other possibilities, among which is that of a wrong identification of the Upper Freeport limestone.) Mr. Backert, the engineer of the Pennsylvania R. R., was quoted by Mr. Affelder as believing with him that the Thick Freeport was merely an abnormal development of the Upper Freeport and not a result of a thinning to little or nothing of the interval between the Freeports.

Mr. Affelder said that at Hamarville a drill hole located the Lower Freeport bed where it belonged, below the Upper Freeport limestone, but the coal bed found was valueless. It was the absence of this bed as a workable seam that made everybody suppose with Jesse K. Johnston that the Upper Freeport was the Lower and the rider bed on the Upper Freeport was not a rider but the Upper Freeport bed itself.

DISTINGUISHES THICK FREEPORT COALS

Mr. Affelder went on to say that he had given several pieces of coal from the rider and from the Upper Freeport to Mr. Thiessen, who, without knowing whence they came, had successfully placed them from an examination of the spore-exines in their correct stratigraphic relation one to another. Unfortunately, Mr. Affelder said, Mr. Thiessen had chosen to call the base bed of the Thick Freeport the Lower Freeport, in accord with information furnished him, but he never failed to distinguish between the coals from the upper and lower half of the Thick Freeport.

Mr. Maize asked why Mr. Affelder had not supplied Mr. Thiessen, for comparison with Lower Freeport, coal from beds the identity of which was not questionable. Mr. Affelder said he had supplied coal from undoubted Upper Freeport as well as from undoubted Lower Freeport measures, but that Mr. Thiessen had said after microscopic inquiry that the spore-exines did not clearly exhibit correlation between the beds in the Thick Freeport measure and the Upper or Lower Freeport beds in other fields, and more work would have to be done.

It would seem that Mr. Affelder has made his point satisfactorily. The Allegheny measures, as Mr. Ashley pointed out, are at the minimum near the Allegheny River and at their maximum near the eastern edge of the coal fields. The acquirement of a rider to the upper Freeport along the Allegheny is a strange freak of

*Second installment describing the technical details of the meeting of the Coal Mining Institute of America, at Pittsburgh, Pa., Dec. 8, 9 and 10.

nature. Where the measures lose several of the characteristic beds of the Allegheny series, this mysterious rider appears and makes up, at least in part, for the beds which the Allegheny series at the Allegheny River appears not to possess.

Mysterious Roof Failure in Cambria County

At the telegraphed request of Alfred E. Roberts, superintendent of the Monroe Coal Mining Co., Mr. Hall read Mr. Roberts' interesting paper on "Some Peculiar Roof Conditions Found in the Central Pennsylvania Field." Mr. Roberts explained how the roof of the mines in that region occasionally broke down in narrow work without giving any warning whatsoever and yet sustained itself satisfactorily in open work. He detailed the various explanations for roof failure usually given—gas, atmospheric disintegration, the effect of air on free lime and so on—declaring that none of these gave a satisfactory solution. He believed the action to be due to the exudation of clay under pressure. He said that the clay probably squeezed out over the pillars and so brought heavy pressure over the roof of the narrow work. After the exudation had taken place the strain was relieved and no further action of that kind was to be apprehended.

Region of Excessive Paleozoic Stress

Mr. Ashley said that apparently there had been an intensification of stress in the area in question which had apparently modified the coal, reducing the volatile matter. It also had caused vertical joints in the coal and apparently had caused excessive vertical jointing in the roof. Mr. Stoek reported a similar condition in southern Illinois, where, because of the jointing, it had been necessary to change the direction of headings so as to avoid the joint planes.

Question 10, as to the "different forms of sulphur in coal and why some are less objectionable than others," was carried over to the next meeting for lack of time, and the meeting adjourned to meet on the following day at the byproduct-coke plant of the Jones & Laughlin Co.

Jones & Laughlin Use Unmixed Vesta Coal

Approximately 150 members were present on Friday morning to make the inspection trip through the Hazelwood byproduct-coke plant of the Jones & Laughlin Steel Co., which fronts on the Monongahela River above the business district of Pittsburgh. This plant does not mix high- and low-volatile coals to make the oven charge, but uses without admixture the coal as it comes from the Vesta mines of the company, which are situated further up the river at California, near Brownsville.

The product is floated down the stream in barges and unloaded from these into a large bin by means of an endless double-bucket chain having a capacity of 1,000 tons hourly. From the main receiving bin the coal is distributed by an elaborate system of rubber-belt conveyors to five storage bins, each of which serves as a central coaling station for one of five larries, each of which supplies a battery of ovens. The Hazelwood plant is composed of five batteries, each containing 60 Koppers ovens. At the time of the visit only four of the batteries were actively in service, for the mill just at present demands only about 80 per cent of the entire capacity of the plant.

The ovens are built with silica-brick sides and a fire-clay bottom. The uniformity of the oven charge is based on volume rather than on weight, but the quantity delivered to each oven is about 12¾ tons. The ovens are charged every twenty-four hours, but as the charging and drawing consume half an hour the net coking period is only about 23½ hours. Gas is not supplied to the ovens for the whole of the coking period, machinery having been installed which allows the gas to enter opposing sides of the combustion chamber every half hour, and this minimizes the amount of gas required.

At the end of the coking period an electric pusher forces the wall of coke, which is 37 ft. x 9 ft. x 17 in. in dimensions, out of the oven and into a steel railroad car for removal to a near-by quenching shed. Here from five to six thousand gallons of water are turned on the red-hot mass. The shed is equipped with a forced draft which drives away excessive moisture. When the quenched product leaves the shed it contains less than 3 per cent of water, which is the limit established by the steel company.

About 67 Per Cent Is Merchantable Coke

The coke is then dumped into storage bins, whence it is conveyed to gravity bar-screens and sized. All sizes under ¾-in. are classed as breeze and used for fuel around the plant. The large sizes are loaded directly into railroad cars as a straight furnace product for shipment to the mills of the company, which are located further up the river near Twenty-second street.

Of the 100 per cent of charge, which is represented by 12¾ tons of coal, 66 to 68 per cent by volume is furnace coke and 7 to 9 per cent is breeze. During the coking period approximately 10,500 cu.ft. of gas are driven off. This gas contains as main byproducts tar, ammonia and the lighter benzene, toluene and solvent naphtha. The fuel-gas value also must not be overlooked. From a single ton of coal may be obtained about 12 gal. of tar, 28 lb. of ammonium sulphate and 4½ gal. of the lighter oils.

So heavy are the tars that are the first to leave that much carbon is deposited on the collection pipes, and arrangements are therefore provided for the periodical "swabbing" of the pipe walls. The gases leave the coal at a temperature of about 700 deg. C., and by the time they reach the cooling tanks their temperature has been reduced to 350 deg., due to the radiation of the heat from the collecting pipes. The gases are finally cooled to 30 deg. C. by contact with sprays. Ammonia leaves after the tar has been driven off. After separation from other gases it is passed through a sulphuric-acid solution, whence it is precipitated as an ammonium salt —ammonium sulphate.

Both Breeze and Gas Go in Part to Mill

The lighter oils remaining in the gas are removed by passing them through oil scrubbers and are separated by subsequent distillation. Of the 4½ gal. of oil which are realized from each ton of coal 50 per cent is composed of benzene, 25 per cent of toluene and there is an equal amount of solvent naphtha. These oils after separation are directed into stills and vaporized. By this process it is possible at varying degrees of temperature to take off an almost innumerable number of oils from the same base. About 90,000 gal. of water are turned into steam hourly for use in the distillation process.

The fuel gas itself is collected and forced to the company mills by huge centrifugal compressors which are

Relation of the Government to Basic Industries as Applied to New England's Coal Supply*

It Was Once Customary to Order Coal Like Groceries, Depending Implicitly Upon the Middleman—Now It Is Necessary to Co-operate with the Source of Supply, Helping Those Who Produce and Distribute It—Benefits of Government Data Cited

By Dr. H. A. Garfield

IT IS remarkable how ignorant even intelligent people can be of conditions lying outside the range of their interest. We are like the pathetic French queen who, when the mob gathered before the palace at Versailles demanding bread, asked in her innocence why they didn't eat cake if they had no bread. I suspect that before the war very few of our fellow countrymen would have been able to pass an examination upon the coal deposits of the United States. Even those who knew where the coal mines were located could not give an intelligent answer to the question: Why can't we get coal? Some said it was shortage of labor; some suspected the middleman of holding back the supply to boost prices; the more intelligent perceived that coal at the pit mouth was no better than coal in the ground, that coal cannot be said in an economic sense to be produced until it is in the bin of the consumer—in other words, that coal production is essentially a transportation problem.

The Middle Westerner, living within easy reach of raw materials, has little conception of the economic problems of the New Englander or the dweller on the plains beyond the Great Lakes. In the Middle West the supply of raw materials is hardly a problem. The coal jobber usually is a nuisance. In New England he is deemed a necessity. The reason is obvious. Where no middle function exists the middleman is not wanted, but coal mines are so far away from New England that some one is needed to bring the producer and consumer together. Whether we have become too dependent and rely too implicitly upon the wholesaler is another question.

New England consumes annually about twenty-five millions of tons of bituminous coal and about ten and a half millions of tons of anthracite. Prior to the Great War New England had to shift for herself, and because the supply of coal was usually greater than the demand those who understood the matter found the least difficulty in procuring the needed tonnage. But the moment the pinch came—when demand outran supply—no matter now for what reason, New England and the near Northwest suffered.

Fuel Vital to the Nation's Basic Industries

The industrial system of the United States is like a giant, his trunk and vital organs—supplying the life blood—lying as it were in the Middle West, his two arms stretched aloft, one into New England and the other into the near Northwest. The life blood must flow strong and pure from the center to these industrious arms. They are the arms of our industrial and agricultural life; they must be supplied and abundantly supplied with life-giving supplies. We dare not permit them to be atrophied. The basic industries of the United States are those engaged in the fundamental processes necessary to the supply of food, fuel, clothing, shelter and transportation.

But what now are we to do about the situation that confronts us? Since the beginning of the Great War New England and the Northwest have been joint sufferers. For the sake of clarity I confine my remarks to coal, that most basic of all commodities. The manufacturers of New England and the farmers of the near Northwest have put forth Herculean efforts to procure the necessary supply. So long as there existed a central authority at Washington clothed with power, supplies were sent forward. But now, when, so to speak, the giant hands must shift for themselves, there may be grudging response from the central station of the giant body. The blood may not begin to flow when the arms put forth effort. When, therefore, it is asked how New England is to meet the situation, I say to you that it cannot be satisfactorily met at this end. There must be a central organ responding to the call for supplies. Coal must flow to our industries as the blood flows from the pumping heart to the working arm. In other words, we must reverse the present process. Heretofore New England has organized to get coal. Henceforth she must organize also to help those who produce and distribute it.

Generally speaking, the New England practice has been to order supplies in much the same way that we order groceries for the household. It is necessary not only that we send in our order but that we co-operate with the source of supply. In other words, we must cease to depend implicitly upon the middleman and must understand for ourselves the problems of coal production and make as direct connection as possible with the producers. To revert to the household illustration, personal and friendly contact with your grocer and an understanding of some of his difficulties, viewed simply as a selfish proposition, is the best insurance against failure of adequate supplies and will bring results that can never be obtained by telephone.

Light Shed on Principles by the War

There are certain things necessary to everybody and which may, therefore, be said to be essential to our national well-being. These things have from time immemorial been grouped under the heads of food, shelter and clothing, and in recent times we have added fuel and transportation. Without adequate and regular supplies of these basic necessities the Republic would soon go to pieces. Therefore, the Federal government, speaking for all the people, must take whatever responsibility is involved. By suitable legislation and executive act it must give the people the freest access to the raw materials required for the production and distribution of these basic necessities. The war made this principle plain to everybody. If, then, the duty rests upon the Federal government, representing all the people, to protect them against any attempt to deprive them of these basic necessities, it is clear that occasion may arise when the interests of the public run counter to those of special groups or sections. In that event it should be obvious that the government, speaking for all the people, must override those speaking for part of the people.

What are the things that threaten a shortage of supply of coal? They may be grouped under three heads: car shortage, labor shortage and high prices. The Federal government is at present sufficiently organized to protect the interests of the public in each of these fields, but it is not sufficient to protect the interests of the public alone. For every consumer is likewise a producer and belongs to one or more of the special groups whose interests may be adversely affected by government action.

It is the duty of the Federal government to determine the policy and to enact and enforce laws necessary to regulate the production and distribution of coal. There is substantial unanimity in favor of regulation. Twenty years ago this was not true. We all remember with what indignation the first attempts to regulate business were greeted. Yet Presi-

*Abstract of an address before the Manufacturers Association, Boston, Dec. 16, 1920.

dent Roosevelt dared to give vitality to the Sherman Anti-Trust Law, and when the anthracite strike of 1902 threatened the supply of domestic coal he called a halt that angered operators and shocked the public. In the same way government must say to labor when, acting in its own interests, it deprives the public of its coal supply, "Thou shalt not."

But this is only negative and in a sense the least important part of the program. Government must stay the hand that would deprive the people of a basic supply. But if it stops there, it stops, so to speak, at the point of irritation. Our attention has been fixed upon the machinery of arbitration and the settlement of industrial conflicts after they have arisen. This, of course, must be provided for. But there is something vastly more important—namely, the prevention of conditions out of which conflicts arise. The members of the U. S. Fuel Administration discovered a way by which this might be accomplished.

Chief Problem Was Increased Production

The first problem that presented itself was the production of more coal and the settlement of industrial conflicts interfering with it. I took the position that the question of union or non-union should not be permitted to interfere with the production of coal during the period of the war, and this judgment was loyally accepted by both operators and mine workers. Nevertheless sources of irritation remained and threatened to develop in such manner as to seriously interfere with the production of coal. The first two advisers I called in were John P. White and Rembrandt Peale—the former the president of the United Mine Workers and the latter a leading operator. They became part of the Fuel Administration—a very vital part of it.

We were forestalling strikes by removing conditions which if left alone would have resulted in curtailing production. This is the principal thing to which I wish to direct attention. It is so simple in itself that it needs the very least of exposition. It is so simple that it escaped our notice until almost the end of the Fuel Administration.

Seldom Resort to Advisory Methods

We Americans are apt at making laws—at clothing somebody with power to do something. Only recently have we here and there resorted to advisory methods. When we have set up an official we have regarded somewhat jealously his right to exercise power undisturbed. We seem to have been actuated by the idea that we, the people of the United States, could appoint our representatives and then go about our business, leaving them to make and enforce laws. Now we are waking up to the fact that eternal vigilance is really the price of liberty and that we must keep ourselves thoroughly informed concerning the acts and proposals of our representatives in government.

It is necessary, however, to go a step further and avail ourselves of the advisory method, if we mean to prevent conditions leading to trouble. The reason is, of course, this: no man is able to know all about even one of these basic industries. I found, for example, that no operator pretended to understand conditions in all the bituminous coal fields. On the other hand, the labor conditions in one field differ so considerably from those in another, due to the different character of the veins of coal and the methods of mining, that from the beginning the mine-workers' union wisely set up district organizations headed by men experienced in each of twenty-nine different districts.

In setting up governmental machinery thus far we have required our representatives to cover so wide a field that they are in no real sense representatives. Certainly they do not know, nor therefore represent, the diverse interests involved. The commissions appointed a year ago to make recommendations looking to our industrial betterment were given too large an undertaking. Each basic industry must be considered by itself. Those who represent capital and labor interests must be in each case men experienced in that particular industry. No commission dealing with the coal industry commands the confidence of operators and mine-workers unless it is composed of experienced operators and mine-workers. If the question concerns anthracite, then operators and mine-workers engaged in the anthracite, not in the bituminous, industry must speak for anthracite interests.

But how, and with what power? They must speak as advisers and not with power to determine policies. As I said a moment ago, Americans are prone to set up officials and commissions and clothe them with power. What our officials need is not more power but more understanding, and because one man cannot know, and hence understand all about everything, he must be advised by those who do know and hence understand.

Government has been so suspicious of industry that men best qualified to speak have feared to approach government officials lest perchance they do more harm than good. The war taught us the folly of this suspicion, as well as the value of co-operation and resort to the advisory method. Let me illustrate from my own experience. John White and Rembrandt Peale, each with his little group of picked and experienced men, sat in offices down the corridor from my office in the Fuel Administration building. We were in daily communication. The power of making regulations governing the production and distribution of coal was in my hands. But I never made a regulation touching the interests of mine-workers or operators without first calling in these advisers for a conference.

Conferences Develop Spirit of Good Will

When the matter affected wages or conditions at the mines I did not call in John White alone, but both John White and Rembrandt Peale, because I realized that, while I was looking at the question from the standpoint of the consumer and the ultimate effect of any regulation upon coal deliveries and prices, Mr. Peale's experience enabled him to judge of the effect of the proposal upon the operators, while Mr. White knew from experience the effect it would have upon the mine-workers. Therefore, when I took action or advised the President, I spoke not of my own wisdom but with the invaluable backing of fact and experience of the two groups directly interested in the production of coal. Later I called in representatives of the Railroad Administration, and of the jobbers, and of the retail merchants. These conferences developed a spirit of good-will, which was the greatest result of all our endeavors.

The value of this kind of co-operation, this resort to the advisory method on the part of an official charged with a grave responsibility, so impressed itself upon us that in February, 1919, a formal conference was called. For four days officials and members of the United Mine Workers and of the National Coal Association discussed the question with the Fuel Administration officials. We felt that our experience ought not to be lost and that it behooved us to present to the President a suggestion that other basic industries might benefit by our experience. It is a remarkable fact that our proposal was unanimously adopted. Neither the members of the United Mine Workers nor those of the National Coal Association spoke in their official capacity but as individuals, for they had not been clothed with authority to commit their organizations. But they spoke with an earnestness that was unmistakable, and when we separated there was more than one expression of belief that we had made a real and valuable discovery.

The discovery consisted in this, that advisers chosen from the groups interested in the production of a basic commodity, coal for example, sitting continuously at Washington under the chairmanship of a permanent officer of government representing the public, would in ninety-nine cases out of one hundred reconcile differences between operators and mine-workers, between the industry and the government, and in the public interest.

One important feature of our recommendation was that the policy-determining function should be kept separate and apart from the fact-finding function. The four things necessary to know before any important step is taken affecting the coal industry are these: the cost of living of the mine worker; this determines the wage basis; the cost of producing and selling coal; the cost of distributing it, and the supplies on hand. The Labor Statistics Bureau of the Department of Labor can determine the first, the Federal Trade Commission the second, the Interstate Commerce Commis-

sion the third, and the Geological Survey of the Interior Department the fourth. These four departments of government ought at all times to have ready at hand information for the use of all the parties in interest. The present disposition of Congress is so to limit appropriations for these departments and bureaus as greatly to cripple a service without which the Fuel Administration would have been powerless and which if continued will prove of inestimable value to the public.

The importance, for example, of a continuous survey of stocks of coal on hand was brought home to us at the beginning of the coal strike in November a year ago. One of the most important departments of the Fuel Administration was the statistical bureau. The Secretary of the Interior had generously allowed Mr. Lesher and six others to be temporarily transferred to us. I was able to expand this little group to more than six hundred. By organizing this force and by installing proper machinery Mr. Lesher was able to tell me every week before the White House meetings the amount of coal on hand. Every week on the average he handled reports from nearly 32,000 of the 90,000 manufacturers reporting. Within five minutes Mr. Lesher could tell me the supplies on hand the previous week, the amounts added to the supply during the week, the amount consumed and the balance left on hand at the end of the week. He was able to give me the information by groups of states, by individual states, by individual manufacturers.

During the first months we did not know the facts and distributed to the most importunate, often robbing Peter to pay Paul. But after this machinery was set up it was quite otherwise. Many a time after this system was in working order, a manufacturer coming to complain of his short supply went away satisfied at least that he was being fairly treated. To send for his card required but a moment, to ask him if the results were correct and to receive his verification was a first step to convince him that we knew the facts—whether his supplies were above or below those of his neighbors and competitors.

Variations in Coal Stocks Shown

In October, 1917, there were 28,000,000 tons of bituminous coal in stock throughout the country. Whether this was normal or not we did not know—the data was not at hand—but we began piling up stocks as soon as the winter was over. By the middle of July, 1918, we had increased the stocks on hand to over 43,000,000 tons. By Oct. 1 we had brought them up to 59,000,000 tons, and we were able to assure the country that even though a winter as severe as the previous one were before us we could pull through without difficulty. On armistice day we had 63,000,000 tons on hand. Then began the drop. Congress cut off appropriations for this work after June 30, 1919. Therefore when I returned to Washington on the eve of the coal strike last year I did not know what stocks were on hand and could only guess. When the coal commission was appointed early this year a small sum was made available and estimates based on about 2,500 selected instances led the Geological Survey to the conclusion that on July 1 this year we had in stock about 20,000,000 tons. Knowledge of the facts is a necessary prerequisite to wise public policies.

I could bring you illustrations with reference to cost of living, cost of production, selling and transportation. But time does not permit, and this one illustration must serve. Let me, however, call your attention to this fact—significant for New England—that although there had been a great falling off in stocks of coal throughout the country, the manufacturing states, including New England, were the greatest sufferers. On Oct. 1, 1918, there was an average of ten weeks' supply of bituminous coal on hand at industrial plants other than iron and steel and byproducts throughout the country. On June 1, 1920, there was an average of only slightly over three weeks' supply on hand. However, the New England states on Oct. 1, 1918, had on hand substantially a six months' supply, enough to carry them safely through the winter. It ranged from nineteen weeks for Connecticut to thirty weeks for New Hampshire, whereas on June 1 this year the New England states had on hand only a little over one month's supply.

These fact-finding bureaus should be freed from the responsibility of determining policies. The attention of the Federal Trade Commission, for example, should be fixed upon one thing only, namely, the cost of producing and selling coal in each of the districts of the country during every month of the year. It should know the number of operations in each coal-producing district of the country. It should know, month by month, the amount produced by each operator, the cost of mining machinery and equipment, the cost month by month to every operator of every item that enters into the production and sale of coal. What should be done with these facts is not for the Federal Trade Commission to determine but for the executive head of the government acting through his chosen representatives.

Secretary of Interior Would Act for President

The plan submitted to the President in February, 1919, as a result of our conferences comprehended each of the basic industries. But it is sufficient to explain the workings of one only. We recommended that the Secretary of the Interior be designated to act as chairman of three commissions, each having to do with fuel—an anthracite commission, a bituminous commission and an oil commission. Please note that these are separate commissions because each is a separate industry, but the public, being interested in each alike, is represented by the Secretary of the Interior acting for the President.

We will consider one, the bituminous coal advisory commission. Let us assume that, in addition to the chairman, it is composed of three mine-workers chosen by the mine-workers' union, and three operators chosen by the operators' association. It is essential that there should be the same number of mine workers and operators on each such commission and that they should be chosen in each case by their own group. This commission should not be given power to determine policies or to make regulations of any sort. It should be purely advisory—advisory to the President of the United States, speaking of course through the Secretary of the Interior as chairman. Upon the President or his Secretary rests the power to make such regulations as may be authorized by the Congress. If legislation is necessary, the Secretary of the Interior conferring with this advisory commission will secure first-hand information as to the need of the proposed legislation and the effect of it upon the public, the mine-workers and the operators. When, therefore, the President recommends legislation to the Congress, his recommendation will be based upon the advice of his Secretary of the Interior speaking with understanding as a result of his conference with the advisory commission.

Urges Advantages of Advisory Commission

If an advisory commission of this sort were in existence, if its offices were located in the Interior building, within easy reach of the Secretary of the Interior, and if the needs of the people of New England could at all times be brought to the attention of the Secretary of the Interior as chairman of that commission, is it not obvious that this simple piece of machinery would enable us to do ten times over that which we are able to accomplish by mere pulling at this end, or even through the persistent and able advocacy at Washington of citizens of the commonwealth whose representations too often fall upon deaf ears—deaf because no one is specifically charged with the responsibility to protect the public in any specific way? The same is true concerning the needs of any other group. If wages are too low or too high or conditions in the mines oppressive, labor will be best served with such a commission. Fair wages and reasonable profits will be more surely obtained with such a commission in existence than at present, and, above all, the rights of the public will be guarded and preserved.

In conclusion, let me urge upon you two things: First, the importance of persuading Congress to appropriate funds sufficient to enable the Interior Department, the Department of Labor, the Interstate Commerce Commission and the Federal Trade Commission to continue to furnish the facts necessary to the determination of our policies. And, second, the value of permanent advisory commissions of the kind I have described and the advisability of advocating their establishment by the President and, if necessary, by act of the Congress.

Problems of Operating Men

Edited by James T. Beard

Anthracite Practice in Working Folded Seams

Anthracite practice points the way to the best method of working highly contorted coal seams.

ANSWERING the query of P. C. Craven that appeared in *Coal Age*, Nov. 4, p. 954, regarding the best method of working badly contorted coal, allow me to offer the following suggestions, as the subject is one in which I was formerly deeply interested.

While engaged as a mining engineer, in the anthracite region of Pennsylvania, I came in contact with problems involving the extraction of coal from seams that were so folded and contorted that the pitch was at times almost perpendicular. These conditions are probably quite similar to those described in the inquiry just mentioned, except in respect to the character of the coal, which is said to be a soft coking coal.

No Fixed Rule Can Be Given To Suit All Conditions

My experience compels me to say that no fixed rule can be given and no systematic plan of development can be outlined for the working of badly folded seams, whatever the nature or character of the coal. Experience and judgment must dictate the methods to pursue in order to obtain the best results, and these methods will vary with the changing character of the seam, as the workings are advanced.

Prior to starting the development of the mine, however, an accurate survey should be made and the results platted on a map, showing not only the extent of the property but the location of the prospect holes sunk at various points and giving the elevation of the coal found in each hole. A careful study of this map will enable an intelligent opinion to be formed regarding the general plan of development to be employed.

Follow the Synclines

As far as practicable, the aim should be to drive the main entries in a direction that will enable the gangways to be turned to the right and left at the low points or in the syncline of each fold. Such gangways serve as local feeders taking the coal from more or less extended sections of the field, each depending on the distance the fold continues. An air-course must be driven paralleling each gangway and may extend along the side of the fold, at a somewhat higher elevation than the gangway.

The practice in the anthracite region is to allow the gangway and its air-course to follow the syncline to the boundary or the end of the fold. It will frequently happen that the fold will run out before the boundary is reached, in which case the gangway and its air-course are turned across the end of the fold and, perhaps, made to follow back on the other side.

Rooms or chutes are driven off the gangway to the rise and connecting with the air-course, after the customary manner of working inclined seams. Assuming that both sides of a fold are traversed by a gangway and its air-course, it will generally be practicable to drive a counter-road along the crest of the fold or on the anticline. In that case, as the chutes hole into the counter-road the pillars are drawn back in the usual manner. If the fold is sufficiently great it may be practicable to drive the first counter-road half-way between the syncline and anticline and another at the top of the pitch.

Where the inclination is considerable it will often prove of advantage to drive the rooms across the pitch on a grade that will enable a mule to haul a car from the gangway to the face of the room. The limit of grade for mule haulage will depend on the size of the car, the style of its equipment and the weight of the mule. A mule weighing say, 1,200 lb. will ordinarily be able to haul a load of a ton up a grade of 8 or 10 per cent.

Conditions To Be Observed If Trouble Is Avoided

The thickness of the room pillars must be governed by the roof pressure, the pitch and thickness of the coal and the nature of the roof and floor. It is important to insist on the miners driving their rooms on sights to avoid trouble from leaving pillars that are too thin. In order to prevent a possible creep or squeeze, every fifth or tenth room should be left solid and that coal taken out when the pillars are drawn back. The track should always be kept on the high side of a room and about 3 ft. from the rib. Where the coal attains a greater height than 10 ft., it will generally be necessary to take it out in benches, working the top bench first and the lower bench last.

Instances will occur when it is not practicable to drive around the end of a fold. In that case, if it is known that there is good coal on the other side, a rock tunnel should be driven through the fold and a gangway and air-course opened on the other side and the coal worked out in the usual manner. Allow me to say in closing, that a good anthracite man would doubtless render valuable service and save thousands of tons of coal that would otherwise be lost in this undertaking. The problem can only be intelligently solved by an examination that would reveal the conditions as they exist.

H. B. Miller,
Pittsburgh, Pa. Mining Engineer.

Points in Working Low Coal

Like a three-legged stool, the proposition of working low coal successfully has three legs to stand on. If one is missing, the proposition like the stool is sure to fall.

AT ONE time, I remember making an application for a position that involved the development of ten-thousand acres underlaid with a seam of low coal. I believe the conditions in that case were much the same as those that confronted "L.E.R." and led him to make the inquiry found in *Coal Age*, Aug. 19, p. 403. The fact that the man was anxious to make good in a place where others had failed shows that he was ambitious and determined to develop the property to the best advantage.

Unfortunately, the inquirer has not stated many important points, such as the extent of the property, inclination of the seam, nature of the roof and floor, depth of cover, etc., all of which have an important bearing on the success of the undertaking. It would seem almost like a waste of time for a friend to give counsel without being informed on these matters. My interest in the working of low coal, however, is so strong that I desire to lend a little help, if possible, by suggesting a few essentials that concern the economy of working.

Many Details Essential To Economy

Judging from the sketch that accompanied the inquiry, it may be assumed that the main haulage road is going on a practically water-level course, since rooms are turned off the butt headings both to the right and the left. Also, it is stated the rooms are driven on 60-ft. centers and, assuming about one-half the coal is taken out in the first working, it is probable that the seam is overlaid with a hard sandrock or a good slate roof. Under these con-

ditions, lifting bottom instead of brushing the roof is, in my opinion, a good plan as it leaves the roof undisturbed. One often finds much annoyance results from sharp projections of the roof being formed when that is once broken.

Without knowing the law in Kentucky, I will venture to say that the main haulage roads should be driven at least ten feet wide and all rock and slate removed. Stowing this material at the side of a main road is more or less of a nuisance. I believe in having plenty of headroom and clearance space at the side of the road. The tracks should be well ballasted and drained, and the rails of sufficient size to carry the heaviest burden without yielding.

Stowing Refuse on Butt Entries Is Economy

In driving the butt entries the bottom taken up to give the required headroom can be stowed at the side of the road. These entries should be driven wide enough to give room for building this waste and leave ample clearance at the side of the track. The life of the butt entries being shorter than that of the main roads, this plan can be followed and will insure a more rapid development and greater economy. The waste should be stowed on the side of the entry opposite to that from which the rooms are turned. It is true, of course, that this refuse will have to be moved again when drawing back the entry pillars; but this can be easily accomplished at that time.

Allow me to suggest that if the coal is to be cut with machines it will be better to drive double rooms, say on 75-ft. centers, leaving 25-ft. pillars between them. This will provide a 50-ft. breast of coal that can be cut with much greater ease than a 30-ft. face. In driving the double rooms a track is laid along each straight rib, thus giving a 25-ft. face of coal for loading on each track. This plan also presents the advantage that the breakthroughs in the pillars can be cut from both sides, which expedites the work and gives an equal amount of coal to each room.

Use of Steel Track Ties Gives Greater Headroom

In working low coal the height of the mine car should not exceed 26 or 27 in. above the rails. A great advantage will be found in the use of flat steel track ties, which enable the easy shifting of the track at the faces of the rooms, in order to reduce the distance the miner has to shovel his coal. There is a steel track tie now on the market that is easily adjusted, all that is required for that purpose being the driving of a wooden plug.

In my opinion, there are three great essentials in the working of low coal, which make this undertaking analogous to a three-legged stool. These three essentials are the following: 1. Safety in every branch of the work. 2. Good ventilation, pure air and plenty of it. 3. Good haulage roads, well timbered and drained and the track kept in good condition. If any one of these three essentials is lacking the successful working of low coal is in danger. Like the three-legged stool, the proposition cannot stand. Failure is certain, sooner or later.

S. D. Hainley

Osceola Mills, Pa.

Give the Fireboss a Chance

On the fireboss, primarily, depends the safety of the mine. The fireboss not merely a certificated necessity to be lightly regarded but a factor whose authority should be unquestioned.

FEW papers have impressed me as deeply as that of D. Harrington, pleading for giving the fireboss a fair chance and greater authority in order to secure a safer mine, *Coal Age*, Nov. 4, p. 943. To my mind, a worthy competent fireboss is "the man of the hour" in any mine and should be held in the highest esteem.

In the wee small hours of the morning when the rest of us mine workers are still comfortably sleeping in our beds, it is the fireboss who steals noiselessly away from his home to take up his daily task. Entering the mine, he inspects alone the workings that will soon be filled with men whose safety is in his keeping. Loyal to the responsibilities of his position, he seeks for danger in every place and on every road and travelingway in his district. How many of us give a thought to the faithful work thus performed and offer a word of encouragement to these guardians of the mine?

More Consideration Is Due the Faithful Fireboss

In the past far too little consideration has been given to the faithful work of firebosses. With little thought for the man whose work, time and again, has saved us from permanent injury, perhaps death; and with but a casual consideration of the nerve-trying hours spent by the fireboss as he hastens over his route always conscious that one little mistake or lack of precision on his part may cost a life, we have been too prone to selfishly make light of one who should receive the greatest credit when his work is well performed.

Today, the fireboss is not to be blamed for the light regard in which he is commonly held. He has manfully done his best. He has followed out the instructions of his superiors in office. On his own behalf, he has spent many tedious hours when he should have been at rest, studying to prepare for the examination required to get his certificate. In this attempt, he should receive all the help that it is possible for mine officials to give him. He should be trained and taught in respect to those principles, rules and regulations that are to govern his work.

It is my belief that, as has been suggested by others, every fireboss should be virtually an assistant foreman and clothed with the same authority. In other words, every assistant foreman should be a competent, trustworthy fireboss. The mistake has been made of employing too few of these officials and giving to each, a territory too large for his careful inspection. As a result, the fireboss begins his work too long before the time when men must enter the mine for work; and portions of the mine examined may have developed danger before the men reach their working places.

My opinion is that, as assistant foremen, firebosses should begin their examination of the mine within two hours of the time for the men to enter the mine. Having completed their several inspections, these men should meet at the shaft bottom or mine entrance, make out their reports in the book kept for that purpose and then report verbally to the foreman.

Firebosses Act as Assistant Foremen During the Dayshift

After breakfasting, each assistant foreman should return to his section of the mine where he should have full charge and inspect the work of each man in the section. His authority should be equal to that of the mine foreman in every question regarding the safety of the men in his section.

It is my earnest belief that an organization of this kind would mean a successful operation in every department of the mining game. Such a plan would give the fireboss every chance he could desire. Each assistant foreman (fireboss) would then be in a position to know the exact condition of every place in his district and he could rightly be held responsible to the foreman for the safety of his men as well as keeping the coal moving and maintaining his share of the daily output of the mine. It is true that too often the fireboss is regarded as a mere gasman and, after making his morning examination of the mine is given other work to perform. No greater mistake could be made in reference to mine safety by officials in charge.

Thomas, W. Va. Ben.

Qualifying Mine Officials

What is not specified in the Mining Laws of the State of West Virginia has been recognized, in the laws of most of the coal-producing states, as a requirement that is needed to qualify mine inspectors for service.

READING the excellent letter of Richard Bowen, *Coal Age*, Dec. 2, p. 1139, regarding the training of mine officials, particularly the training of assistant foremen by their superiors in office, I have been more than ever impressed with the necessity of our mining laws being more specific in their treatment of the qualifications required of all mine officials, from inspector and superintendent to fireboss.

In regard to the qualifications required to make a man eligible to the position of mine foreman, or assistant foreman, these are too well known and have been stated too frequently in *Coal Age* to make their repetition necessary here, and the same is true of the position of fireboss.

Most mining laws require that candidates for the position of foreman, assistant foreman or fireboss shall pass an examination before a State Examining Board appointed by the governor, in order to prove their competency to fill these positions. But few, if any, of the mining laws of the different states require the examination of candidates for the position of mine superintendent. In my opinion, this is fully as important as the examination of the other officials just mentioned.

Mining Laws Should Be Revised

It is my belief that the mining laws of all the leading coal-mining states should require the examination of candidates for the position of mine superintendent, which should be of a higher grade than that given to mine-foreman candidates. The questions asked should be of a nature designed to show whether or not a candidate for the position of superintendent has a knowledge and experience that make him a competent man to place in charge of a gaseous or a non-gaseous mine.

At the present time, we find many unqualified men filling this posiiton of trust and responsibility. There are numerous instances where the mine superintendent does not understand the simple rudiments of mining and is unable to advise his foreman in matters pertaining to the future development of the mine. The attempt of an incompetent superintendent to do this has often proved a great handicap to a good foreman, who is unable to adopt the unpractical ideas presented by his superintendent.

On the other hand, we are glad to say there are many mine superintendents who are competent and qualified in every way for the position they hold. Their counsel and advice have proved of great value and assistance to foremen who have been called to face difficult problems in the development and operation of the mine. Many of these problems involve conditions that must be carefully considered and thrashed out by men of experience in a mutual conference. But, where the superintendent has little or no practical experience underground, it is impossible for a foreman to receive help in this way.

The West Virginia Mine Law

Strange as it may seem, the West Virginia Mining Laws do not require the examination of its state mine inspectors, neither the chief of the Department of Mines nor the district inspectors who are appointed by him. Regarding the chief of the Department of Mines, the West Virginia law (Sec. 4) does require that he shall be a male citizen of the state, a competent person having at least eight years' experience in the working, ventilation and drainage of coal mines in the state, and a practical and scientific knowledge of all dangerous gases.

Regarding the district mine inspectors, the law requires (Sec. 9) that the district inspector shall be a citizen of the state, of good moral character and temperate habits, have a practical knowledge of mining and the proper ventilation and drainage of mines, also a knowledge of the gases met with in coal mines, besides having at least six years experience as a miner or otherwise employed underground.

Neither in reference to the chief inspector nor a district inspector does the West Virginia law state that the inspector must pass an examination to prove his competency and practical knowledge of mining. My suggestion is that this law should be revised or amended in such a manner as to require the examination and certification of all mine inspectors employed by the state.

Although the West Virginia law does require (Sec. 63) that a mine foreman shall hold a certificate of competency granted him by the Department of Mines after he has passed a satisfactory examination, no such requirement is mentioned regarding an assistant foreman. The law also requires (Sec. 58) that the fireboss shall hold a certificate of competency granted him by the Department of Mines after examination.

Instead of the examination of mine foremen and firebosses being given by the Department of Mines, may I suggest that the law should require the appointment of a Board of Examiners comprised of the chief of the department of mines and two miners, to be appointed by the governor of the state. The law should state that the two miners shall be of good character and have an ability that will enable them to judge correctly the merits of all applicants as to their fitness and competency to fill the positions they desire.

Allow me to suggest, further, the appointment of a similar Board of Examiners for state mine inspectors, such board to be composed of a mining engineer not connected with any mining corporation, one operator and one miner, all of whom shall be thoroughly practical men, of good character and sound judgment.

These suggestions are submitted in a spirit and with a desire for the general benefit of mining conditions in the state. This is a progressive age and our ideas should be correspondingly progressive. Tact and ability are required to compete successfully with the growing complications in coal mining.

John E. Ambrose,
Fairmont, W. Va. Mining Engineer.

Inquiries Of General Interest

Observed Breathing of a Sealed Section of a Mine

What is aptly termed the "breathing" of a mine or sealed section of the workings the result of numerous causes and conditions some of which may be obscure to the casual observer.

In the mine where I am employed it has been the custom to seal off abandoned sections. One of these located on the third and fourth north off the main west entry contained some twenty rooms that had been driven up and finished. The roof had fallen and the section was sealed, except one end of the panel left to be sealed later.

According to our custom, tests have been made each day to discover whether the air is being drawn in or blown out through the seal. I have been greatly interested, recently, in watching the results of these tests. For nine consecutive days they showed that air was being drawn into the enclosure behind the seal. Then, for five consecutive days following, the tests showed that air and gas were being forced out of the enclosure. All the tests were made at practically the same time each day; and there appears to be no reason for the observed change of condition within the sealed section. I want to ask, What might have been the cause?

Bruceville, Ind. Fireboss.

This correspondent should have submitted a sketch of the section of the mine to which he refers, showing the general circulation of air in the mine and stating whether the ventilation is by the blowing or the exhaust system. The sketch should also show the position of the stoppings sealing off the abandoned section and the end of the panel, which it is said, is yet to be sealed.

Without this information and a knowledge of other possible conditions no accurate conception can be had that would suggest the true cause of the observed change that took place in the breathing of this section. It is necessary to know to what extent the mine is generating gas and whether this comes from the coal, the roof or the floor, the nature of the roof and floor and the condition of the overlying strata, which may or may not be broken to the surface.

In case the roof-breaks extend to the surface, the question of the system of ventilation employed, whether blowing or exhaust, is of the utmost importance. If the breaks reach the surface, barometric changes will have their effect to alter the breathing of the sealed section in the mine.

The fact that one end of the panel is yet to be sealed raises the question of the possible effect of temperature changes on the breathing of the enclosed space. Again, it is quite possible that roof falls or a general subsidence of the roof over this area may explain the blowing out of the air and gas

during the last five days in which the observations were taken.

When a section is first closed off by sealed stoppings it is possible, in the exhaust system of ventilation, for the air and gas within the enclosure to be drawn out by the depression existing in the mine, which is then ventilated under a pressure below that of the atmosphere. Particularly is this the case if the roof is broken to the surface; but the reverse of this would take place where the blowing system of ventilation is employed, which we assume is probably the fact in this case.

It may be remarked that changes made in the circulation of the air by splitting the current, or otherwise, whereby the mine pressure in the neighborhood of the sealed section would be reduced would explain the change in the breathing of the section from drawing in to blowing out. With the meager information at hand, however, it is only possible to offer suggestions any one of which may be applicable to the case in hand. *Coal Age* will be glad to have this matter further discussed, and hopes that more explicit details will be given to aid in the discussion.

Examination Questions Answered

Examination for Mine Foremen, Eleventh Anthracite District

(Selected Questions)

QUESTION — *What is the area, perimeter and rubbing surface of an airway 14 ft. 6 in. by 6 ft. 9 in. and 3,500 ft. long? What quantity of air would be passing if the anemometer registers 542 ft. per min.?*

ANSWER—The sectional area of this airway is $14.5 \times 6.75 = 97.875$ sq.ft. The perimeter of the airway is $2(14.5 + 6.75) = 42.5$ ft. The rubbing surface is $3{,}500 \times 42.5 = 149{,}000$ sq.ft.

Assuming the reading of the anemometer is an average reading for the entire cross-section of the airway, the quantity of air in circulation is $97.875 \times 542 = 53{,}049$, say 53,000 cu.ft. per min.

QUESTION — *Describe the various methods of propping and timbering slopes, gangways and chambers in anthracite mines.*

ANSWER—Slopes having little or no inclination are timbered in the usual manner by setting posts or double timbers consisting of a crossbeam or collar supported by one or more posts, or resting in hitches cut in the rib of the entry. The method used and the style of timbering will vary with the nature of the roof, floor and coal and the inclination of the seam. Where the roof is particularly frail or tender, it will be necessary to use lagging above the collars and to set the timber frames closer together. Post timbering is commonly used at the faces of chambers or rooms, and good cap-pieces or booms are placed over the posts and against the roof in such a manner as to provide the greatest support for the roof slate. With a soft bottom, the posts are often stood on foot-pieces to prevent their sinking into the floor when they take the weight.

All posts and timber frames set on inclines should be given a slight inclination up the pitch from a normal position in the seam. This is termed "undersetting." The amount a post is underset will vary with the inclination of the seam and its purpose is to overcome the tendency of the roof to slip down the dip, which would loosen the posts if they are set perpendicular to the roof and floor. On the other hand, the slip of the roof downward will tighten a post that is underset.

The timbering of a steep slope includes giving the track proper support to prevent its sliding down the slope. This is accomplished by the use of occasional long ties that are hitched into the rib on each side of the track. At other times, short braces or struts are inserted between the track ties and the ribs, at short intervals, which has the same effect. When the inclination of a slope approaches the vertical the slope is timbered with square sets in the same manner as a shaft.

QUESTION — *If a water-gage reading is 1.95 in. what pressure per square foot does it indicate, and what would be the horsepower if the quantity of air produced is 150,000 cu.ft. per min.?*

ANSWER — A water-gage reading of 1.95 in. corresponds to a pressure of $1.95 \times 5.2 = 10.14$ lb. per sq.ft. For a circulation of 150,000 cu.ft. per min., against a pressure of 10.14 lb. per sq.ft., the horsepower on the air is

$$H = \frac{Qp}{33{,}000} = \frac{150{,}000 \times 10.14}{33{,}000} = 46 + hp$$

QUESTION—*At what point in the mine would you expect firedamp to be standing and how does firedamp appear in a safety lamp?*

ANSWER — Firedamp is any inflammable or explosive mixture of mine gas with air. Ordinarily, the mixture is lighter than air and accumulates at the faces of pitches and in rise workings in mines generating gas, provided the air current is not of sufficient volume and velocity to dilute the gas and sweep it away thereby preventing the formation of a firedamp mixture.

When a safety lamp is exposed to firedamp and the latter enters the combustion chamber of the lamp, the first effect is to produce a slightly luminous flame cap surmounting the wick flame, which is somewhat lengthened owing to the presence of the gas. The length of the flame and the height of the cap will vary with the percentage of gas present. As this increases, the volume of the flame is enlarged, causing it to completely fill the lamp. In other words, the lamp "flames." With a still higher percentage, or when the gas is "sharp," little air being present, a crackling sound is often heard and light explosions occur within the lamp.

Tenth Anthracite District

QUESTION—*Of what elements is air chiefly composed?*

ANSWER—Pure atmospheric air at the surface of the earth is found to contain 20.9 per cent of oxygen and 79.1 per cent of nitrogen. Normally, pure air contains a trace (0.03 per cent) of carbon dioxide.

QUESTION—*Express the chemical composition of the following gases by means of the usual symbols: carbon dioxide, carbon monoxide, methane and ethane.*

ANSWER—The chemical symbol of carbon dioxide is CO_2, indicating the chemical union of 1 atom of carbon with 2 atoms of oxygen. The chemical symbol of carbon monoxide is CO, indicating the chemical union of 1 atom of carbon with 1 atom of oxygen. The chemical symbol of methane is CH_4, indicating the chemical union of 1 atom of carbon with 4 atoms of hydrogen. The chemical symbol of ethane is C_2H_6, indicating the chemical union of 2 atoms of carbon with 6 atoms of hydrogen.

QUESTION—*A ventilating fan is producing a water gage of 2 in., at a speed of 60 r.p.m.; what should be the water gage when this fan is running at a speed of 40 r.p.m.?*

ANSWER—Assuming that there is no change in the circulation of the air in the mine, the quantity of air produced by the action of a centrifugal fan is generally taken as varying directly as the speed or number of revolutions per minute of the fan, and the pressure or water gage as the square of the speed. On this basis, the volume ratio is equal to the speed ratio, and the water-gage ratio is then equal to the square of the speed ratio. Since the speed ratio in this case is $40/60 = 2/3$ and its square $4/9$, the required water gage, at a speed of 40 r.p.m., is $4/9 \times 2 = 8/9$ in.

In actual practice, however, the quantity of air in fan ventilation falls short of this estimate, and likewise the water gage. The fourth power of the speed, in practice, has been found to vary about as the fifth power of the quantity, which makes the eighth power of the speed vary as the fifth power of the water gage. In other words, the water gage does not fall as rapidly as the speed decreases. A decrease in speed from 60 to 40 r.p.m. will show a fall in water gage from 2 in. to 1.04 in., or say 1 in.

Anthracite Operators Refuse to Grant Concessions Demanded by United Mine Workers

Operators Declare That While Wages Are Falling and Work Is Irregular the Anthracite Mine Workers Have High Wages and Steady Work and Should Feel Abundantly Well Satisfied with Their Contract

At a meeting of the joint committee of anthracite operators and representatives of the United Mine Workers in the anthracite field held in Philadelphia Dec. 23 the representatives of the operators presented their formal answer declining the proposal of the mine workers to adjust the alleged "inequalities" in the contract of Sept. 2, 1920, so as to give the mine workers an additional increase of approximately 13 per cent in wages, with a minimum of $6 a day for labor.

The reply of the operators is as follows:

"After a series of conferences, held at the request of the President of the United States, for the purpose of discussing certain 'inequalities' which you claim exist in the award of the U. S. Anthracite Coal Commission, you asked at our last meeting that your request for the adjustment of these 'inequalities' be construed as a demand for a general increase of approximately 13 per cent to contract miners, with the establishment of a minimum day wage of not less than $6 for an eight-hour day for day workers, and that a definite reply be made by the operators to your demand for a reopening of the award of the U. S. Anthracite Coal Commission.

"We have carefully considered your proposition and herewith make reply. If in the application of a general wage award such as that made by the U. S. Anthracite Coal Commission there be individual cases of inequality, so far as such may be found to exist we stand ready to agree with you on a constructive remedy. So far, however, as the question of reopening the award is concerned, we must definitely decline your proposition, for the following reasons:

Award of Commission Intended To Be Final Till 1922

"(1) The award of the U. S. Anthracite Coal Commission was a final disposition of wage matters in the anthracite region for the period of two years from April 1, 1920, and under the terms of submission its findings were written into an agreement, effective as of that date, which constitutes a binding contract upon both parties subscribing thereto.

"The commission represented the three parties at interest, viz., the mine workers, the operators, and the public. The repudiation of this award by the operators and miners alone would be a breach of faith with the public, which was a party to the submission. The operators decline to be a party to an agreement which would, in effect, be a compliance with demands which, after full consideration, were denied by the commission.

"For almost twenty years wages and working conditions in the anthracite industry have been governed by agreements. At the termination of the contract ending March 31, 1920, there was a failure to reach an agreement. After eight weeks of negotiation the Secretary of Labor invited the negotiating committee to meet with him in Washington. His offer of mediation was accepted by the operators, but declined by the miners. Thereupon by common consent the matters at issue were submitted to arbitration by a commission appointed at the instance of and by the President of the United States, with the condition that the findings of such commission should be written into an agreement which would be retroactive to April 1, 1920.

"This commission sat for five weeks and did not adjourn the hearings until each side had completed its testimony and argument. There can be no contention that full consideration of the merits of the matters at issue was denied, and both parties, in accordance with their previous agreement, are in honor bound to adhere to the terms of the award. If results obtained by an arbitration undertaken under such circumstances, prosecuted with so much effort, and finally and formally accepted by both sides in accordance with the terms of the submission, are to be so lightly regarded, it is plain that there can be no reliance on arbitration.

"After years of unsuccessful efforts on the part of your organization to obtain through an agreement a formal recognition of the United Mine Workers of America by the anthracite operators, the award of the commission granted this demand. Recognition was granted in the face of former denials largely because of your representation as to the distinct autonomy of the anthracite districts; and yet one of your first acts after the agreement was signed has been to demand, with insistence, its abrogation, on the plea that it is not in accord with the wage rates in the bituminous field.

"Collective bargaining is founded on the principle that both parties shall in good faith observe the terms of their agreements, and in the anthracite field it must, in order to be successful, take cognizance of the conditions in that industry as they affect the earning capacity of its employees, and their health and welfare, as compared with conditions in other industries similarly located and constituted. It cannot be made to depend upon rates paid in the bituminous industry, where conditions are vitally different.

Cost of Living Has Steadily Lowered Since Award

"(2) In the judgment of the operators no condition has arisen since the award of the commission, either in the general wage structure of the country or in the cost of living, which has produced a burden upon the anthracite workers. On the contrary, many classes of workers in other industries have voluntarily accepted a reduction in wages and the cost of living has steadily declined.

"The wage rates established by the U. S. Anthracite Coal Commission were substantially equal to and in many respects higher than the wages paid for similar conditions of employment in surrounding industries. The hourly rates of earnings established by the commission provided increases for inside employees averaging 132.8 per cent over 1912 (contract miners' earnings increasing from 42.5c. per hour to 99.2c.); for outside employees an increase of 167.5 per cent (common laborers' earnings advancing from 18c. per hour to 52.5c.), and for all employees an average increase of 138.6 per cent (average hourly earnings for all employees advancing from 30.3c. per hour to 72.3c.).

Award Now More Favorable Than When Made

"Since the date of the award there has been a marked and continuing decline in business activity, which has decreased the opportunity for employment in other industries. The anthracite industry has not as yet been affected by those adverse conditions and the terms of the award are more favorable to the employees at the present time than they were at the time the award was made. It is highly important that the stability of the industry should be maintained in order that the opportunity for steady employment may continue uninterrupted.

"It is therefore a time for constructive effort on the part of employers and employees in the industry, a time for harmony and co-operation rather than of discord and of insistent demand for concessions which cannot be granted, for the reasons above outlined."

The document is signed by F. H. Hemelright, C. F. Huber, W. J. Richards and S. D. Warriner.

Calder Committee Raid Fails to Yield Evidence of Wrongdoing by National Coal Association

Straightforward Evidence of J. D. A. Morrow Establishes Propriety of Association's Activities — Investigators Not Satisfied with Explanations of High Prices — Calder Still Seeks Graft to Justify Nationalization Scheme

WASHINGTON CORRESPONDENCE

IF THE unexpected visit of representatives of the Calder Committee on Reconstruction and Production to the offices of the National Coal Association resulted in the discovery of any evidence of wrongdoing on the part of the association, it was not disclosed during the hearings which followed. David Wing, a consulting economist retained by the committee; Walter Y. Durand, detailed to the committee by the Federal Trade Commission, and other assistants are continuing a search of certain of the association's records of which the committee took temporary possession.

J. D. A. Morrow, vice-president of the association, who is in charge of the Washington office, was subjected to a grilling examination by members of the committee and by its counsel. His straightforward replies and explanations evidently satisfied the committee that in many respects, at least, their suspicions had not been well founded. At least one member of the committee referred to him as having been an excellent witness, while many in attendance regarded his explanation as having established the entire propriety and legality of the National Coal Association's activities.

FAIL TO PROVE IMPROPER INFLUENCE

The effort of the committee to develop that the weekly coal reports of the U. S. Geological Survey had been influenced by the fact that the National Coal Association contributed $500 per month for their maintenance during the interim between the termination of the Fuel Administration and the beginning of the next fiscal year was anything but convincing. The determined effort to make something of the fact that the National Coal Association has contributed this $500 monthly apparently has fallen flat.

Among the papers found in the National Coal Association's file was the correspondence with one of the local coal-trade bureaus of Illinois in regard to the reporting to the Survey of production figures by districts in that state. This bureau had declined to give any returns whatsoever unless the figures for Illinois were given as a whole, rather than by districts. It was brought out that the Geological Survey could do nothing but accede to the demand. As the furnishing of the returns is entirely voluntary, the Survey preferred taking what the local bureau would give rather than get no returns from it whatsoever. It also was made clear that there had been no secret made of the contribution by the National Coal Association. The fact was published generally at the time and the entire transaction is explained in detail in the annual report of the director of the Geological Survey, submitted at the opening of the present session of Congress.

The discovery on Mr. Morrow's desk of a copy of a letter written to Senator Edge by the director of the Geological Survey led to insinuating questions as to whether the National Coal Association is furnished with copies of the Geological Survey's correspondence with members of Congress. Instead of anything improper being shown, it has been developed that the release of the letter was obtained in a perfectly ethical manner from Senator Edge's secretary. A number of other bubbles were pricked in the same manner.

The committee evidently expects to use the fact of the refusal of the Illinois bureau to furnish figures except those of its own liking as its main argument in contending that the returns should be compulsory, rather than voluntary. Incidentally, in that connection the action of the local bureau was not upheld by the National Coal Association. The correspondence showed clearly that the position of the National Association was all that the committee could ask.

Numerous attempts were made by Mr. Morrow, George H. Cushing and by Colonel D. B. Wentz to explain the high prices which prevailed until recently. The committee quite evidently is not satisfied with any explanation that has been made and it will not be surprising if it goes further into the matter. The suggestion has been made that the committee would have developed more interesting information had it seized the books of some of those who stand between the producer and the ultimate consumer.

In connection with the hearing a number of rumors are afloat. It is not clear to many why the Calder committee is delving into the investigation already begun by Senator Frelinghuysen's committee. There is a rumor that Senator Calder's statement with regard to the nationalization of coal mines had proven displeasing to President-elect Harding. Should Senator Calder be able to develop that the coal trade is honeycombed with graft and that the public is being systematically mulcted in a wholesale manner, it would furnish some basis for his nationalization statement. The rumor is afloat that this is his endeavor.

It also is alleged that some inspiration came from within the Federal Trade Commission and from another semi-public interest which is unfriendly to the National Coal Association.

CONTRACTS UNFILLED BECAUSE OF PRIORITY ORDERS

George H. Cushing, general manager of the Wholesale Coal Association, with offices in Washington, the first witness called by the Calder committee on Tuesday, Dec. 21, was questioned by Chairman Calder as to the membership of the association, its revenues and its work. Mr. Cushing said it had about six hundred members, the dues were from $25 to $100 a year and the yearly receipts were about $45,000. It was organized at the instance of the Fuel Administration in 1917 to assist the administration in fuel matters. It had been reorganized in 1918 for the purpose of studying the merchandising of coal and to get a constructive coal program. Asked about the breaking of contracts, Mr. Cushing said he believed in the fulfillment of contracts, but that

priority orders of the Interstate Commerce Commission diverting coal to New England and to the Lakes, had prevented the fulfillment of contracts. Mr. Cushing said the price of coal has been gradually coming down, and consumers could now name their price.

"That is interesting to us," said Senator Kenyon, of Iowa, who said all the evidence before the committee tended to show that prices were high. Senator Edge, of New Jersey, said he had been informed by a consumer that he was paying $21 for coal from Pennsylvania and wanted to know the reason for the difference as compared with the mine price of $4 and $4.50.

Mr. Cushing said high prices were not unusual in October, as there was a panicky market and there might have been isolated cases of small quantities selling at high prices. Senator Calder remarked that the War Department had paid $11 a ton for coal in November.

As early as April, Mr. Cushing said, wholesalers sought to prevent inordinate prices, but their efforts were fruitless, as public officials had continually harangued the people about an impending coal famine, which spread panic among buyers, who thereupon purchased regardless of their needs and regardless of prices. Large consumers gave commissions to buy coal and sent agents to compete with them. Contracts were set aside and priorities increased alarm among buyers. Those who opposed exports overstated the situation and placed undue emphasis on labor conditions in England. The situation disorganized the wholesalers, who were played upon by temptations caused by alarming statements of fuel shortage by federal and state officials.

"Did you state during this time that there was plenty of coal and that prices would go down?" asked Senator Edge.

"I did" replied Mr. Cushing. "Beginning in April and throughout the summer I issued statements and made public addresses all over the country to the effect that there was plenty of coal and no shortage." He added that the Executive Committee of the association issued statements that the alleged shortage of coal was without foundation and advising the members to avoid high prices.

Denies Combine Controlled Bituminous Output

In reply to Senator Edge he said that some wholesalers did sell at high prices, that the association could not control individual actions, as the members could not get their coal under contract and had to compete with purchasing agents of the government and of consumers in obtaining coal. He said that no large combinations controlled the output, as there was no dominant influence in the bituminous field.

Asked as to what government agencies alarmed the people over a coal shortage Mr. Cushing named the Railroad Administration, the Interstate Commerce Commission, the Council of National Defense, the Geological Survey and the Frelinghuysen coal committee of the Senate. If the country had been free from these alarming influences, Mr. Cushing declared, there would have been an equitable distribution of coal and at fair prices. But instead the people were thrown into a panic and bought coal regardless of their immediate need and of price. He said a public utility in central New York had an assigned-car order for two cars a day and also bought 30,000 tons spot.

"Do you approve of priority orders?" asked Senator Edge.

"I do not," was the reply. "They did not add a pound of coal to the production. The Interstate Commerce Commission was panic stricken in issuing these orders."

"Can we announce as coming from your association that if firms purchase coal under contracts in the old way, covering their needs, and there is no competition in the field, that coal will not be beyond the normal price, considering additional cost of labor?" asked Senator Edge.

"Until we have another war and another explosion and disorganization of business, the people of the country may forget that there is a coal problem and disregard the possible danger of a fuel famine or runaway prices, provisioned on the statement that the government does not kill the transportation system," said Mr. Cushing. He said he had more doubt about the 1920 Transportation Act than about the ability of the coal supply to meet the country's needs. He declared that the Transportation Act did not offer an incentive to build new railroad mileage. He declared that a criminal law was needed rather than discretionary powers of the Interstate Commerce Commission, as the railroads were told by the commission what they could or could not do. The country needed protection against the immorality of railroad men. He would exclude railroad mechanics from such a law, and let anybody build a railroad, provided it was not against the public interest.

Mr. Cushing referred to a questionnaire which had been sent out by the Council of National Defense as to coal requirements, but said that it was not published because a great many who answered were not telling the truth.

F. T. Miller, counsel of the committee, asking about coal exports, said that during July, August and September coal was exported at Tidewater at the rate of forty million tons a year, but Mr. Cushing said exports were only about twenty million tons.

Senator Kenyon asked if the wholesalers could not make contracts with operators and do away with competitive buying. Mr. Cushing said it could be done, but that during the last few months people were wildly buying coal. He instanced the fact that Henry Ford employed ten agents to buy coal for his Detroit plant. Three of these agents did not know the identity of each other in Kentucky and bid against one another and raised the price of coal one day from $9 to $11 a ton. Manufacturers of central New York had placed orders with five agents who also competed against each other.

Senator Edge suggested a government regulation prohibiting the purchase of more than the requirements of an individual or firm. Mr. Cushing said this would go against the theory of Senator Frelinghuysen, who advocated a five months' supply. He estimated there was in storage now between forty-five and fifty-five million tons—a thirty days' supply—which would average the year around sufficient to meet every possible need. He was not opposed to putting the price down to a low figure.

Senator Calder asked Mr. Cushing if he had advised his members not to answer a Department of Justice questionnaire, producing the following telegram sent by Mr. Cushing July 30 last:

"Am advised by competent counsel you need not answer Department of Justice questionnaire. Important you do not disclose name of operator or his price, as it will prove detrimental to your business. Give your own business only, if you can do so. Please disseminate."

Uncertainty Concerning a Reasonable Price

Mr. Cushing said he had sent this telegram to the Board of Directors after consulting counsel—Messrs. Stansfield and Levy—and after consultation with Judge Ames of the Department of Justice and Attorney General Palmer, in defense of the legal rights of members of the association on a legal point that was not definitely clear. He had asked Judge Ames what was meant by a reasonable price and also the definition of a crime under the Lever law, but the Department of Justice could not tell what was a reasonable price so as to avoid incrimination of the members. He said the coal men had been charging a margin which they thought was within the law, but there were legal questions about it, and as the price a grand jury might fix might be below this figure he advised the members not to become informers against the operators. He said the Department of Justice had stated that it had exceeded its rights in the case.

Senator Edge thought the telegram was an invitation to keep up prices, but Mr. Cushing said the tendency was the other way, the members merely standing on their legal rights. Mr. Cushing said he told Attorney General Palmer he was sending the telegram and that Mr. Palmer said it was entirely proper. As there was uncertainty about the law he did not think the members should be disgraced by criminal proceedings. In reply to Senator Calder Mr. Cushing said he had requested the members of the association to submit reports on prices, which he said he would submit to the committee.

Mr. Cushing favored an anti-trust law for railroads instead of the Interstate Commerce Commission and said the commission should be abolished or its functions divided so that there would not be the present situation, the com-

mission acting as an executive, legislative and judicial body. "When railroads charged rates as they pleased, we had reasonable rates and transportation; when we stopped that we had unreasonable rates and no transportation," declared Mr. Cushing. He said that in the 113 years' history of the coal trade there never was a threat of a shortage.

Mr. Calder asked about unsold American coal on the French market and if it would be sent back to this country. Mr. Cushing said he had heard that there were 250,000 tons unsold in Europe, which has been sent on speculation during the English strike.

A sensational turn was developed when, in reply to Senator Edge as to where the coal profits went, Mr. Cushing said, "Everywhere; operators, wholesalers, and in some cases it went to officials of the U. S. Government who went into the coal business; in other cases it went to railroad men who confiscated coal and resold it to themselves and divided the profits."

"Is that in violation of the Lever law?" asked Senator Edge.

"I don't know," was the reply.

"Who are the government officials?" asked Senator Kenyon.

Mr. Cushing asked that that be considered a privileged communication, as he would not like to reveal it.

"What part of the government are they in—legislative, executive, or what; army or navy?" pressed Kenyon.

Mr. Cushing said he did not care to reveal names publicly, as the matter had been passed, and no good would come of it; but Senators Kenyon, Edge and Calder insisted that the public was entitled to know if public officials had profited. Mr. Cushing tried to withdraw the statement but the committee was insistent that he reveal the names, either publicly or in private, and Mr. Cushing promised to inform the committee confidentially, saying, "There is no chance for it to return; it is no use to dig into the grave."

Eagerly Seek Names of Government Profiteers

"If government officials have made profits in handling coal, the people ought to know it," demanded Senator Kenyon. Mr. Cushing explained that the panic over coal unloosened human nature. After Mr. Cushing conferred privately with the committee it was stated that he had told the members that a group of government employees headed by a dollar-a-year man who has since left the government had organized a pool to profiteer in coal and had made as much as $600,000 on a single deal by sharing a profit of $1.50 per ton on 450,000 tons. Railroad men and an army officer were named and cases cited where coal was diverted from its route for private gain or where advance government information was translated into dollars by the exploitation of panic-stricken consumers. In some cases, Mr. Cushing was told, there could be a fifty-fifty split with him if he would make the proper move, and in one particular case he was offered 25c. a ton for himself if he would get 400,000 tons for the persons interested, which would have meant a profit of $100,000, which he spurned.

At Wednesday's session Mr. Cushing told the committee that the coal men had not planned the series of government statements and actions which had caused a shortage panic.

J. D. A. Morrow, vice president of the National Coal Association, was subjected to a severe examination as to its operations and activities before the departments and in legislation.

Fortified by the minute books, financial transactions and correspondence of the association, seized by the committee earlier in the week, Senator Kenyon, of Iowa, quizzed Mr. Morrow unmercifully as to the motives of the association. Preceding this, however, Mr. Morrow explained why he differed from Mr. Cushing as to the coal situation, Mr. Morrow insisting that there had been a shortage and that the Geological Survey figures disproved Mr. Cushing's statement that there was no shortage. Mr. Morrow explained that the association was organized at the instance of the Council of National Defense and co-operated with the Fuel Administration. Mr. Morrow was a dollar-a-year man with the Fuel Administration, in charge of distribution of coal. The price had been fixed by the Fuel Administration men who had nothing to do with coal. Mr. Morrow had had an understanding with Dr. Garfield that he was not to have anything to do with price-fixing.

Senator Kenyon asked as to the membership of the association and its purposes and Mr. Morrow said it comprised about 2,200 of the 7,000 bituminous coal producers. Mr. Morrow ascribed the recent coal situation to lack of cars at the mines and the switchmen's strike, which dislocated coal movement in the principal coal regions of the East for six weeks. Mr. Morrow was questioned also as to the finances of the association and Mr. Miller produced a balance sheet of the association showing its receipts and expenditures for the last three years, commenting on an item of $100,000 for counsel fees.

"Do you attempt to influence legislation?" asked Senator Kenyon.

"No," was the answer. "When there is legislation before Congress which affects the coal industry we endeavor to have the views of the association presented to the proper committee or Senators, so that they may be advised of the situation. We have never lobbied. We only make such representations as can be done in a proper way."

Unwilling to Favor Any One Locality

"Why have the office in Washington? It is not the coal center," commented Senator Kenyon.

Mr. Morrow replied that there had been some discussion of moving the office away, but it might be construed as favoring a special locality, and there also was the need of maintaining quarters in Washington because the association had to handle matters before the Interstate Commerce Commission and the American Railroad Association.

"Do you secure information from operators as to cost of production?" asked Senator Kenyon.

Mr. Morrow said the association in November began to obtain information for 1919 and 1920 with the intention of presenting it to the Calder or any other committee, and expected to present it, showing reports of production and profits of operators.

Senator Calder asked if the association sent its members reports of production and price of other operators. Mr. Morrow said the association did not, although in April, 1919, it had endeavored to obtain from various local associations information as to prices which had been obtained on closed transactions and to give that information to the public for the benefit of the consumer and producer. This information was presented to the Frelinghuysen committee up to November, 1919, and then the government fixed prices and there was no need for the figures.

When government prices were removed in April, 1920, the Department of Justice announced that it would consider the collection and dissemination of such information illegal. The Board of Directors was advised by counsel that it was proper for coal men to obtain this information the same as was done with wheat on the Chicago Board of Trade and cotton on the New York market but that the association decided to discontinue the reports until the courts decided the question.

Senator Edge wanted an explanation of the variation in the price of coal, from $21 and $23 a ton. Mr. Morrow said there was only a small quantity of coal, which was bid for wildly by excited buyers.

"Why do you say a small portion, when in August and September no consumer could get coal for less than $16 to $22?"

Mr. Morrow said the committee had not heard from people who had received coal on contracts at lower prices.

No General Breaking of Contracts by Operators

Senator Edge insisted that contracts were abrogated, and Mr. Morrow admitted that some contracts might have been but that there was no general breaking of contracts by coal producers during the last nine months. He said coal contracts were scrupulously observed, while consumers frequently canceled their contracts when prices declined.

Senator Kenyon asked how it was that the Shipping Board had to pay $16 a ton for bunker coal at Norfolk. Mr. Morrow said the board did not make contracts. He declared the failure of the board to contract for coal was an inexcusable example of mismanagement. Mr. Morrow said the

members of the association were not charging high prices, and if they did he was not responsible for their sales. The highest prices were paid by manufacturing plants.

Senator Calder said that public utilities with contracts could not get a third of their coal yet they could get coal at spot prices. Senator Edge also insisted that it was common knowledge that people could get all the coal they wanted at high prices. Mr. Morrow said the cars were taken away from operators who had contracts and some operators who operated a large number of mines paid bonuses to miners to produce coal for spot sale.

Senator Calder read a letter to the association from a man in Pittsburgh, saying that if public utilities wanted to pay the price they could get coal. Mr. Morrow said public utilities abused the priority order, which was later abolished and there is and was no reason for utilities to stock coal in the Pittsburgh district. The association had nothing to do with prices, blacklisting or contracts.

Senator Calder asked if the members told Mr. Morrow of prices. Mr. Morrow said that they did not.

Quotes Cleveland Speech of Colonel Wentz

Senator Kenyon read several extracts from the speech of Colonel D. B. Wentz, president of the National Coal Association, at the Cleveland meeting last autumn in regard to the work of the association. Mr. Morrow said the association officers had informed Secretary Tumulty in a proper manner of the coal situation and of what the association was doing to correct the situation. He said the association did not favor the creation this year of a Fuel Administrator not from a selfish interest but because such an organization would not remedy the situation.

Quoting Colonel Wentz as saying the association would fight the Lever law and Fuel Administration, Senator Kenyon asked "Your association was against legislation by Congress regulating the coal industry?" Mr. Morrow said such legislation was not necessary. "Your theory is that coal is a private matter?" asked Kenyon. Mr. Morrow said the association opposed coal regulation openly and with legitimate means, as coal in this country would last seven thousand years and control by the government was not necessary.

"So you want to control your own industry, so that abnormal prices may continue?" asked Senator Edge.

"The association does not control the industry; competition will keep prices down," replied Mr. Morrow.

"We are looking for a solution so that past conditions will not recur," said Senator Edge. "Would it be a violation of the Anti-Trust Act if your association controlled 50 per cent of the coal and if you sold with the understanding that dealers to whom you sold could not quote prices beyond a certain maximum?" Mr. Morrow said this would have a strong effect on the situation.

Senator Kenyon, referring to Colonel Wentz's statement of what the association was doing in Washington, asked "was the purpose to influence legislation?" "No," said Mr. Morrow.

Objected to Stipulation on Keeping of Books

Senator Kenyon asked why the association enjoined the Federal Trade Commission from requiring cost reports and Mr. Morrow explained that it was because the commission sought to stipulate the manner in which the coal companies kept books, which was essential to the management of their business. They could not keep two sets of books, as they have been required under the commission's order. The commission also sought to require a different system of book accounts than those required under the revenue laws, although the Treasury and commission could not agree on one form. Many of the coal companies said the matter should be taken up by the association on behalf of the industry, and the association advised the commission the suit would be filed questioning their authority to obtain the reports, and the District of Columbia Supreme Court sustained the injunction. The question of disclosing profits did not enter into the suit.

In reply to various questions as to actions taken by the association, as read by Senator Kenyon from the minute book of the association, Mr. Morrow said the committee acted on current matters, rendering its opinion, but made no concerted effort to put statements in the hands of members of Congress. Its comments in letters to members on various phases of legislation also was a matter of deduction from current events.

Secretary Reed of the National Coal Association was examined as to the finances of the association and was asked about an item for salaries of clerks of the Geological Survey in compiling coal statistics. Mr. Reed explained that the association had contributed to the employment of clerks in the Survey in the publication of coal statistics. For this $400 a month was given but no allotments for this purpose had been made since June 30. The payments were made by arrangement with the Survey, which had no funds to continue these statistics, which were considered of value to the public. He admitted in reply to Senator Kenyon that it probably was not good policy for a government to accept outside contributions, and Senator Kenyon remarked that Congress had stopped the Rockefeller Foundation from paying clerks in the Agricultural Department.

Mr. Morrow, asked as to the opposition of the association to an embargo on coal, said it was based on the ground that a single industry should not be singled out for an embargo. Senator Edge, however, said that coal entered into the daily life of the people, and said that while there was a shortage of coal the association had opposed an embargo. Mr. Morrow said it was important to continue the export of coal to foreign countries who relied on America for coal. Senator Edge was inclined to agree that an embargo against a single industry was unfair, but added that there might be some situation justifying unusual remedies.

New England Consumers in Competition

Senator Calder said that Tidewater coal for domestic use could not be obtained because the facilities were all used for export, and Mr. Miller said that New England bought its coal in competition with export coal. Mr. Morrow said this was not true, as the New Englanders competed among themselves.

Senator Kenyon asked as to the association paying the clerks of the Geological Survey to obtain coal figures and Mr. Morrow explained that the offer of the association to the Survey to do this was accepted when there were no funds of the Survey for this purpose and it was considered important to the public that the figures be continued. The association made no request as to how the work was to be done. "Do you think that is a good principle?" asked Senator Kenyon. "No," said Mr. Morrow, "but if the figures are of vital concern to the people they should be continued even by private subscription."

Senator Kenyon produced a letter from an Illinois operator objecting to the giving of the working time by Illinois districts, and said that the Survey had changed the report so as to include the working time for the state only and not by districts. "The change was not made at our request" said Mr. Morrow. He said the relations of the association with the Survey were such as to permit cordial co-operation but were not improper.

"Did you try to secure the passage or defeat of bills?" asked Senator Kenyon, referring to action taken by the association on various measures. "A great many of those resolutions are perfunctory in the form of registering our position. We have not engineered propaganda in behalf or against bills. We do not send letters or interview Congressmen. Our work is done in a proper way."

Colonel D. B. Wentz, president of the association, was called to explain why the War Department bought coal at $11 a ton. Colonel Wentz explained that Secretary of War Baker had ordered coal purchased at that price. None of the coal was bought from mines in which Colonel Wentz was directly or indirectly interested. He said the War Department insisted, against his advice, on buying large quantities of coal in September at high prices, when if the order had been spread over a longer period the coal could have been obtained more cheaply.

On Sept. 16 last, Colonel Wentz said, he was one of a number of coal men who had been asked by the department to purchase a million tons of coal, the government fixing its maximum price at $11 a ton and allowing a fixed com-

mission of 5c. a ton. Colonel Wentz said he advised the War Department representative to buy only a little coal and then buy a little more later, to benefit by receding prices. Immediate purchase was insisted on, however, and the coal was obtained in the open market at the then prevailing prices. Colonel Wentz said the coal of his mines had sold during the last few months at an average price of $3.50 a ton.

Colonel Wentz was asked if he had heard of government officials profiteering in coal. He replied that he had heard of instances but had no personal knowledge on the subject.

Efficiency of Railroads Greatly Increased Under Private Operation

IN the nine full months since the Government turned back the railroads to their owners on March 1, according to Thomas DeWitt Cuyler, chairman of the Association of Railway Executives, the railroad companies under private operation have:

(1) Increased the average movement per freight car per day 6.3 miles—from 22.3 to 28.6 miles.

(2) Increased the average load per car 1.7 tons—from 28.3 to 30 tons.

(3) Made substantial reduction in the number of unserviceable locomotives.

(4) Reduced the accumulation of loaded but unmoved freight cars from 103,237 on March 1 to 21,991 on Dec. 3, of which only 6,386 were detained because of the inability of the railroads to move them.

(5) Relocated approximately 180,000 box cars from the East to the West for the movement of farm produce.

(6) Relocated approximately 180,000 open-top cars from the West to the East to keep up the production of coal.

(7) Moved the third highest coal production in the history of the country.

(8) Spent over $500,000,000 extra on improving the maintenance of tracks, bridges, cars and locomotives.

(9) Contracted to spend about $250,000,000, largely out of earnings, for additions and betterments to promote the movement of cars.

(10) Made arrangements to purchase approximately 50,000 new freight cars, 1,500 new locomotives, and 1,000 new passenger cars.

(11) Begun the reconstruction of thousands of old cars.

(12) Moved—with a deteriorated plant, under disturbed labor and business conditions—the largest volume of traffic ever known in a single year, with the highest efficiency yet achieved, and with a minimum addition to the value of the property on which the public has to pay a return through rates.

THERE WAS A decrease of 5,053 cars, or approximately 252,650 tons, in coal handled by the Chesapeake & Ohio Ry. during the month of November as compared with the month of October, 1920. While the decrease was partly attributable to several holidays, a serious congestion also was a factor in lowered loading. Cars loaded in the various districts for the two months were as follows:

District	November	October
New River	10,502.6	11,455.0
Kanawha	10,462.7	11,205.7
Coal River	4,581.4	5,194.0
Logan	16,245.8	18,892.4
Kentucky	5,413.2	551.4
Totals	47,205.7	52,258.5

DURING THE LAST fiscal year the Bureau of Mines turned into the Treasury the following miscellaneous receipts:

On Account of—	Amount
Royalties from coal mined on leased Government lands	$25,584.93
Fees fur tests of explosives	5,687.00
Fees for tests of mine lamps	78.50
Fees for tests of explosion proof motors	200.00
Fees for assays of ore	459.75
Fees for coal analyses	2,154.00
Sales of publications	14,645.70
Sales of old worn out material	1,350.79
Fees for copies of records	24.55
	$50,185.22

Quotations on Bunker Coal in Foreign Ports as of December 1

WILLARD, SUTHERLAND & CO., INC., bunkering contractors for coal and oil, issue the following quotations on bunker coal in foreign ports as of Dec. 1. They announce that these quotations are simply an indication of prices current at the time the lists were made up and are subject to change or withdrawal without notice.

Adelaide	44s. to 49s., according to point of delivery.
Aden	155s., Indian or South African. 210s., Welsh coal.
Albany, Australia	54s.
Algiers	150s.
Alicante	210 pesetas.
Amsterdam	80.50 guilders.
Almeria	Upon application.
Antwerp	100s. to 135s., according to quality.
Azores	165s.
Bahia	242s., 6d.
Bahia Blanca	200s.
Barbados	155s.
Barcelona	210 pesetas.
Batavia	35.50 to 66 fl., according to quality and point of delivery.
Bermuda	$22.
Bilbao	160 to 175 pesetas, according to quality.
Bombay	37.4 rupees.
Bordeaux	No coal available.
Brisbane, Australia	17s. 11d. to 24s. 1d., according to quality and point of delivery.
Brixham	Upon application.
Buenos Aires	195s.
Cairns, Australia	64s.
Cape Town	72s. 6d. to 77s. 6d. according to quality.
Cadiz	200 pesetas.
Cardiff	75s. to 82s., according to quality.
Cartagena	205 pesetas.
Colombo	90s. 3d.
Constantinople	210s., New River.
Copenhagen	215s., British or American coal.
Corcubian	170 to 185 pesetas, according to quality.
Corunna	170 to 185 pesetas, according to quality.
Curacao, D.W.I	$26.
Dakar	162s. 6d.
Dartmouth-Portland	110s.
Delagoa Bay	58s. 3d.
Drontheim	197 kr.
Fowey	110s.
Fremantle	50s.
Gibraltar	140s. plus 1s. export duty; 130s. plus 1s. from Dec. 16
Glasgow	77s. 6d. to 78s. 6d.
Gothenborg	153 kr.
Grimsby	70s. to 75s.
Hamburg	203s. 9d., German coal.
Havre	No coal available.
Hook of Holland	77.50 guilders.
Huelva	200 pesetas.
Hull	70s. to 75s.
Karachi	24 rupees.
La Plata	195s.
Las Palmas	161 s.; 146 s. from Dec. 16.
Leith	76s.
Liverpool	Upon application.
London-Gravesend	103s. 9d. North Country. 111s. 6d. Welsh.
Madeira	168s. 6d.
Malaga	205 pesetas.
Malta	150s.
Mauritius	140s.
Melbourne	39s. to 42s., according to point of delivery.
Montevideo	195s.
Newcastle, Australia	26s.
Newcastle, U. K	75s. to 80s.
North of Scotland	No coal available.
Oran	145s.
Padang	40.64 fl.
Pasages	160 to 175 pesetas, according to quality.
Pernambuco	242s. 6d.
Plymouth	110s.
Port Kembla	30s.
Port Natal	71s. to 72s. 6d., according to quality
Port Pirie	39s. 6d. to 41s.
Port Said	170 s. plus 5s. emergency tax, British or American coal.
Port Said	161s. 6d., + 5s. emergency tax, Indian coal.
Pulo Laut, S.E. Borneo	35.56 fl.
Rio de Janeiro	225s.
Rosario	200s.
Rotterdam	75 guilders.
St. Lucia	155s.
St. Thomas, V. I	154s.
St. Vincent, C.V.I	152s. 6d.; 147s. 6d. from Dec. 16.
Sandnessjoen	197 kr.
Santander	160 to 175 pesetas, according to quality.
Santos	227s. 6d.
Singapore	95s. to 130s., according to quality.
Seville	Upon applicntion.
Sourabaya	35.56 to 66 fl., according to quality and point of delivery.
Southampton	112s.
Swansea	75s. to 82s.
Sydney, Australia	32s.
Sydney Harbor, Australia	25s. 3d.
Tarragona	Upon application.
Teneriffe	161s.
Townsville, Australia	54s. to 64s., according to point of delivery.
Trinidad	154s.
Trondjhem	165s.
Valencia	210 pesetas.
Vigo	170 to 185 pesetas, according to quality.
Villagarcia	Upon application.

Smokeless Association Appoints McVann Executive Vice-President

HAVING found it necessary to maintain a permanent Washington office, the Smokeless Coal Operators' Association of West Virginia, at its annual meeting in Philadelphia, Dec. 13, amended its constitution and by-laws so as to permit the creation of an additional vice-president and conferred that title on E. J. McVann in addition to his present title of secretary. It was believed advisable to have the Washington office in charge of an executive officer instead of a ministerial officer.

The place of the annual meeting was changed from Philadelphia to New York. The officers elected to serve during 1921 are as follows:

President, G. H. Caperton (president, New River Coal Co., Charleston, W. Va.); first vice-president, E. E. White (president E. E. White Coal Co., Glenwhite, W. Va.); second vice-president, O. M. Deyerle (president Flat Top Fuel Co., Bluefield, W. Va.); third (executive) vice-president, E. J. McVann, Washington, D. C.; treasurer, George R. Collins (vice-president Smokeless Fuel Co., Charleston, W. Va.); secretary, E. J. McVann (re-elected).

There was a record attendance of operators from all four districts composing the field—Pocahontas, Tug River, New River and Winding Gulf—and also of their sales representatives, nearly one hundred members being present. John J. Tierney, of the Crozer Pocahontas Co., Philadelphia, the president, presided at the meeting.

For membership on the Board of Governors the Pocahontas district renominated T. E. Houston and O. M. Deyerle, the Tug River district renominated George Wolfe and John T. Wilson, and the New River district renominated Charles C. Beury and Robert H. Gross. The retiring Governors from the Winding Gulf district, P. M. Snyder and E. E. White, requested to be relieved from the duty of serving in 1921, and in their stead were nominated John Laing and A. J. King. G. H. Caperton was nominated by the C. & O. operators as their representative on the membership committee; William C. Stephenson by the N. & W. as theirs and W. B. Beale by the Virginian operators to represent that territory. All of the nominees were then unanimously elected by the meeting of members.

Tidewater Coal Exchange's Existence in Peril, Complaint Committee Says

SOME drastic reforms must be inaugurated if the present Tidewater Coal Exchange is to survive, according to the report of the Committee on Complaints of the Exchange. This report is now in the hands of the Executive Committee of the Tidewater Coal Exchange, and although it has not yet been made public it is known to contain some far-reaching suggestions and recommendations.

The committee, which was appointed following the adoption of a resolution at a meeting of the Exchange held early in October, does not hesitate to state that in its opinion this is a critical period and that unless certain changes are made at once there may be withdrawals of numerous shippers which might result in the ending of the pooling of bituminous coal at New York, Philadelphia and Baltimore.

The present system of accounting is condemned as being entirely unsuited and the Executive Committee is advised to study the system in use at the Sewells Point Coal Exchange with a view of installing it or a similar method. The committee believes that every member should have a statement showing the exact condition of his account at midnight preceding the date of the receipt of the report by the member. In addition to furnishing the above report, the Sewells Point Exchange, the committee says, also furnishes to every member of that Exchange a report as to his standing in every pool at every pier within twenty-four hours from the time of arrival and dumping.

As a sort of auxiliary to the present committee on classification of coals it is suggested that a classification board of at least three engineers, with an adequate force of assistants, be created. The report, it has been learned, does not advise the abolition of the present board on classification but says that it can perform valuable service in its application of practical knowledge to the technical knowledge of the experts.

The work of inspecting coal also is in need of change, in the opinion of the committee. The force of inspectors should be increased and it is believed that there would be greater satisfaction if the coal was inspected at the scales. This would give the shipper better opportunity to reconsign his coal, thereby saving him the necessity of either sacrificing his coal or paying extra freight charges, as would result if the coal were reshipped to another destination.

The Executive Committee is urged to take prompt action regarding the recommendations and suggestions. The Committee on Complaints consists of E. D. Enney, of New York, chairman; Noah H. Swayne 2d, Philadelphia, and Benjamin H. Reed, Baltimore. Charles S. Allen, secretary of the Wholesale Coal Trade Association of New York, is its secretary.

Upper Potomac and Georges Creek Sign Up

DURING the third week of December the new working agreement for District 16, in which are included the Upper Potomac and Georges Creek regions, was ratified by both operators and mine workers, there being, as far as could be learned, little or no opposition by either party to the contract which had been worked out at Baltimore, Md., in a conference lasting from Tuesday, Dec. 7, until early Sunday morning, Dec. 12. The action of the representatives of the miners was approved by representatives of the various locals in District 16 at a convention held at Cumberland on Dec. 16.

Operators of regions affected gathered at Cumberland in joint session on Friday, Dec. 17, and gave their assent to the provisions of the agreement reached earlier in the week at Baltimore, that agreement providing among other things for a joint board for the settlement of disputes. The operators named as their representatives on that board William H. Gibson and William Diamond, of the Upper Potomac field, and John S. Brophy and E. Marshall Gillette, of the Georges Creek region. Late last week the mine workers had not yet designated the men to represent them.

For a time, it will be recalled, a strike appeared to be imminent, but finally on Nov. 30 operators and miners met in conference at Baltimore, at which time the demands of the miners were presented. A week was taken by the operators in which to consider such demands, another conference being held on Dec. 7—a week later. No change was made by the conferees as to working hours or wages, the miners still enjoying a high wage rate. A marked change was made, however, in the method of arbitrating disputes. Instead of retaining that feature of the Maryland plan which provides for the appointment of an arbitrator by the Judge of the U. S. Circuit Court, the new agreement creates a joint board, composed equally of miners and operators. If the board so constituted is unable to agree upon questions referred to it for adjudication, then an umpire is to pass finally upon such disputes. Aside from the feature just mentioned the District 16 agreement is quite similar to that known as the Maryland plan.

Mines in the Upper Potomac and Georges Creek regions will continue to be operated as "open-shop" mines, that being one point upon which the operators declined to yield, although from all that can be learned the representatives of the miners strongly pressed that feature of their demands.

While there were twenty-two conferees in all—eleven representing miners and eleven representing the operators—the demands of the miners and the drafting of an agreement were placed in the hands of a sub-committee of operators and miners, the members of that committee being E. Marshall Gillette, of the Consolidation Coal Co.; John S. Brophy, of the Piedmont & Georges Creek Coal Co.; R. P. Maloney, of the Davis Coal & Coke Co.; T. M. Dodson, of Weston Dodson & Co.; the committee representing the miners consisting of John P. White, former president of the United Mine Workers; Francis J. Drum, acting president of District 16; A. D. Ware and Aleck Brady.

The Weather Vane of Industry

News Notes Chronicling the Trend of Industrial Activities on Which Depends the Immediate and Future Market for Coal

THAT the bottom of the present business depression will be reached in the next thirty days is the opinion of Archer Wall Douglas, chairman of the Committee on Statistics and Standards of the Chamber of Commerce of the United States.

"Advances of any moment in the prices of agricultural products," says Mr. Douglas, "will materially change the situation for the better, and reductions in the prices of commodities are likely to cause increased business in all industrial sections. Acute phases of the present depression will wear away steadily as the public adjusts itself to changed conditions brought about by a return to normal.

"From the unfounded fears of last spring of bread lines in the cities and shortage of food everywhere, we are awakened to the startling realization of a harvest so great that we cannot at once find an adequate market for our surplus products. So there ensues that inexorable law of supply and demand which decrees that overproduction is always accompanied by falling prices. This phase of the situation is peculiarly accentuated in the Southern States, where the second largest crop of cotton grown is met by a much reduced demand both at home and abroad.

"In the South there is developing a strong sentiment toward largely restricting the acreage of cotton this coming spring. This plan is always brought forth in the days of low cotton prices, but has never been carried out in anything like the measure proposed by its advocates. In many ways a cotton production restricted to somewhere near the probable demand would be a wise proceeding if it were possible to forecast what the demand would be.

"Meanwhile the bankers are well loaned up and are chary about extending any further credits to either merchants or farmers under present conditions. Merchants, like farmers, are buying only enough stock with which to do business. This means a much lessened volume of business, rigid economy on all hands, close collections and a general return to a strictly cash basis by an increasing number of merchants.

"The answer, of course, is that the natural laws of supply and demand will ultimately work out the situation and no remedies or plans to bridge over the emergency can obscure this fact."

Steel Plants to Curtail 50 Per Cent

Announcement of wage reductions, which promise to spread, and the closing of many plants for an indefinite period mark a new and advanced stage in the liquidation process in iron and steel, according to the *Iron Trade Review*. It is estimated that fully 50 per cent. of the steel-making and mill capacity of the country will be shut down until some time after Jan. 1. Steel Corporation plants will not reduce at this time, in view of its favorable operating position. All indications, however, point to the beginning of a general readjustment of labor costs in the steel and iron industry which eventually will extend from the ore mines through the finishing mills. Eastern plate mills as a group are idle for the first time since 1915. In decided contrast to this situation, the Steel Corporation plants will be operating with slight interruption, as they are working against a heavy order book. At Pittsburgh they closed last week on Christmas Day only. The Carnegie Steel Co. operated last week at 95 per cent. of ingot capacity, with full output engaged for some months ahead. The Illinois Steel Co. is on an 85 per cent basis, while the American Sheet & Tin Plate Co. last week ran at 96 per cent., the highest point in two years.

P. R. R. Orders $9,400,000 Rails

The Pennsylvania R.R. has ordered 200,000 tons of rails at $47 a ton, deliveries to begin early next spring. This order, calling for $9,400,000, is much larger than normal rail purchases of the company, the 1919 tonnage being 106,000. The order was distributed among these companies: Illinois Steel Co., 50,000 tons; Carnegie Steel Co., 50,000 tons; Bethlehem Steel and Midvale Steel & Ordnance Co., 45,000 tons each, and Lackawanna Steel, 10,000 tons. An order for 5,000 tons of 130-pound section steel rails, which has been placed with the Carnegie Steel Co. by the Philadelphia & Reading Ry. completes the Reading's 25,000-ton allotment for 1921. Of the rails previously ordered 5,000 tons will come from the Carnegie Steel Company and 15,000 from the Bethlehem Steel Company. The Santa Fe R.R. is inquiring for another block of steel rails in addition to those recently ordered.

Knitting Mills Idle a Week

Mills of the William Carter Co., which operates knitting goods factories in Needham and Springfield, Mass., are closed this week. When the plants resume a 20-per cent cut in wages will become operative. A 5-per cent bonus was given this year as usual.

Boston & Albany Shops Dull

The Boston & Albany R.R. car shops at West Springfield and in the Allston district of Boston, employing about 100 and 200 men, respectively, shut down Dec. 27 until further notice because of "decreased business."

Willys-Overland Subsidiary Closes

The two Toledo factories of the Electric Auto-Lite Co., a subsidiary of the Willys-Overland Co., closed Dec. 24, throwing 400 men and women out of work. C. O. Miniger, president of the company, who announced the closing, did not state when operations would be resumed.

Plate Glass Plant Suspends

More than 1,500 men were thrown out of work until Feb. 1, when the Edward Ford Plate Glass Co. plant at Rossford, Ohio, closed down Dec. 23. Officials of the company declared that there is no contemplated reduction in wages when operations are resumed. The reason given for the shut-down was for a "readjustment of financial affairs."

Coats' Thread Shops Shut Down

J. & P. Coats, thread manufacturers, announced Dec. 23 that their mills in Pawtucket, R. I., would be closed from Dec. 24 until Jan. 3. About 3,500 are employed in the plant.

Foreign Markets and Export News

Five Months' Exports of Coal to Canada Average Nearly 2,000,000 Net Tons Per Month

Exports of United States coal into Canada during the first eleven months of 1920 are shown in the following table, furnished by the Geological Survey. Of marked interest are the bituminous receipts during the last five months, which have totalled 9,558,000 net tons, or more than twice the tonnage of the first six months. November imports—2,048,00 net tons—establish a new maximum for the period under review.

Month	1917	1918	1919	1920
Total six months, January-June	6,393,000	7,739,000	5,703,000	4,662,000
July	1,581,000	1,671,000	1,283,000	1,722,000
August	1,891,000	1,671,000	1,291,000	2,033,000
September	1,568,000	1,605,000	1,204,000	1,787,000
October	1,583,000	1,545,000	1,356,000	1,968,000
November	1,273,000	1,440,000	892,000	2,048,000
Total (net tons)	14,289,000	15,671,000	11,729,000	14,160,000

British Weekly Coal Output Exceeds 5,000,000 Tons

Provisional figures of the British weekly production of coal during the four weeks ended Nov. 27 are given in the current issue of *The Board of Trade Journal*, which gives the output for the week ended Nov. 27 as 5,176,500 gross tons, against 5,210,700 gross tons in the previous week. For the corresponding week in 1919 the output was 4,762,729 gross tons. The statistics are as follows:

Week ending Nov. 6..... 756,300 gross tons.
Week ending Nov. 13.....4,775,600 gross tons.
Week ending Nov. 20.....5,210,700 gross tons.
Week ending Nov. 27.....5,176,500 gross tons.

Late advices indicate that production in the week of Dec. 4 exceeded that of Nov. 20.

Swiss Importations of Coal in October Came Mostly from America

Importations of coal into Switzerland during October, American Trade Commissioner Groves, of Zurich, states, amounted to 174,716 metric tons. Of this amount 75,107 tons came from America, 52,712 from England, and only smaller amounts from Belgium and France. It is noted that about 28,000 metric tons came from the Saar and Ruhr basins. It is stated that coal imports into that country for the first eight months of 1920 were practically double those for the similar period of 1919 and 10 per cent in advance of the corresponding period of 1913. Sufficient stocks to supply the Federal railways and larger industries for the coming winter are reported to be on hand. Reduction of about 10 per cent in the price of coal has resulted from the government importing monopoly.

Rapidly Reconstruct Devastated French Mines

In an inventory of progress two years after the Armistice the French Commission in the United States says that two years ago France had lost in destruction of coal mines more than half of the country's total coal producing capacity. Twenty-two mines with pre-war output of 20,000,000 tons annually, or half of France's coal production, were destroyed in the Departments of Nord and Pas de Calais.

One half of these mines are now operating, those in the Nord Department being expected to produce 50 per cent of their normal output by the end of the year and to reach normal production next year. These mines produced in January last only 85,483 tons. In September their output was 299,819 tons. In October, 18,653 miners, out of 44,418 normally employed, were working in the mines.

Including Alsace-Lorraine, French coal mines averaged 2,000,000 tons per month during the first nine months of the present year. The production for September was 2,419,015 tons.

Austria Unable to Obtain Fuel Requirements

Austria's monthly fuel requirements are figured at 1,156,000 tons of coal and 11,040 tons of coke. With nearly every country having to curtail to some extent its use of coal Austria does not expect to obtain its full requirement. The Coal Controller states that the industries could be maintained if 70 per cent of this requirement—800,000 tons of coal and 80,000 tons of coke monthly—were forthcoming.

In 1913 the mines of Austria produced an average of 228,925 tons of coal monthly; in 1919 the average was 172-925 tons monthly. It may be said, therefore, that 15 per cent of the full requirement can be produced within the boundaries of Austria, leaving 85 per cent to be obtained through import.

Passenger traffic on the Hungarian railways on Dec. 18 was ordered suspended from Dec. 23 to Jan. 4, owing to lack of coal. Private houses throughout the country are without coal.

Prussian Coal Output Increases

The output in metric tons of the collieries in Prussia, the most important of all German coal districts, covering the period January-September, was as follows, the figures including the Saar Basin:

	1920 Tons	1919 Tons
Pit coal	92,400,000	81,100,000
Lignite	66,600,000	55,600,000
Coke	18,000,000	15,600,000
Briquets:		
Pit coal	3,000,000	2,400,000
Lignite	14,600,000	11,800,000

The total figures on record of the output of the Ruhr collieries, including the works in the occupied territory, during October show an increase of approximately 300,000 tons as compared with the preceding month (the number of working days being the same), the figures being 8,100,000 tons in October and 7,801,086 tons in September.

WHILE HOPE OF obtaining any important benefit during the present season from the lifting of the prepayment requirement on Canadian coal has been abandoned, the matter is to be pushed actively with the idea of having the question settled and out of the way at the earliest possible date. Since the beginning of the coal year negotiations have been in progress between the American Wholesale Coal Association, the railroads and the Interstate Commerce Commission looking to the relief of shippers and consignees who suffer much inconvenience in having to prepay all freight charges on coal for Canadian points. The matter is to be the subject of a conference in Washington in the near future in which all concerned will participate. It is regarded as probable that final action will be taken following that conference.

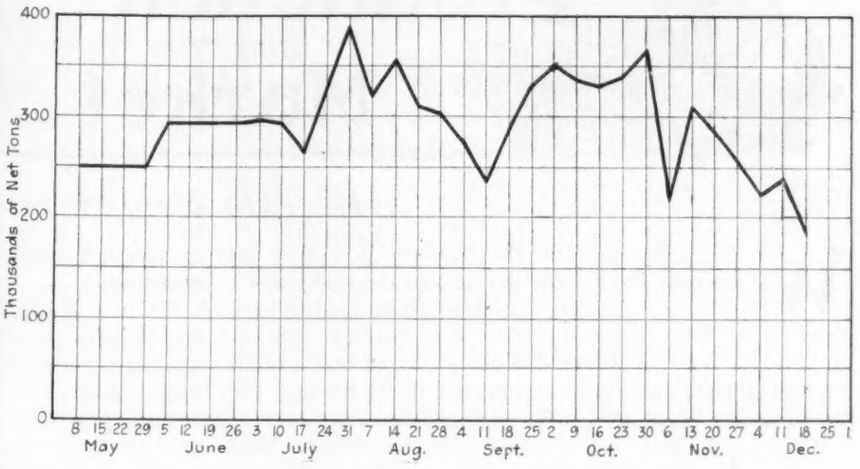
LACK OF COALING FACILITIES in northern Chilean ports is advised from Antofagasta, Chile, according to *Commerce Reports*. All vessels are requested to carry sufficient coal to return to the Panama Canal. Because of labor troubles northern ports are refusing to coal steamers that are arriving from Valparaiso and southern ports.

Export Dumpings

(NET TONS)

Week ended	
Nov. 21	528,000
Nov. 28	399,000
Dec. 5	387,000
Dec. 12	374,000
Dec. 19	393,000

Export Coal Dumped at Hampton Roads



Shipping Board Rejects All Coal Bids

ALL bids received for furnishing next year's supply of bunker coal for American merchant ships at Atlantic and Gulf ports have been rejected, the Shipping Board announced in Washington Dec. 22, as the prices, which ranged from $7 to $11.50 a ton (*Coal Age*, Dec. 16, pp. 1249 and 1250), were regarded as excessive.

New bids for approximately 2,000,000 tons of bunker coal for delivery at Atlantic coast ports for a period of one year will be received and opened Jan. 14.

Bituminous Coal Produced in Eleven Months in Central Pennsylvania*

(In Net Tons)†

Period	1917	1918	1919	1920
January	5,103,621	4,637,131	5,114,716	4,390,827
February	4,351,331	4,666,093	3,148,078	3,635,195
March	5,260,725	5,318,134	3,482,408	5,002,902
April	4,497,326	5,084,292	3,404,602	4,254,075
May	4,840,767	5,214,803	3,649,957	4,105,668
June	5,044,325	5,393,048	3,831,680	4,404,480
July	4,851,237	5,590,414	4,386,820	4,705,956
August	5,139,502	5,702,102	4,832,219	4,947,492
September	4,716,933	5,104,013	4,865,074	5,162,333
October	5,311,568	5,265,562	5,580,692	5,112,382
November	5,174,841	4,137,915	1,205,294	4,960,312
Totals 11 months	54,292,176	56,113,507	43,501,540	50,681,712
Average monthly	4,935,652	5,101,227	3,954,685	4,607,428
December	4,366,641	4,401,611	3,044,841	.....
Totals for year	58,658,817	60,515,118	46,546,381	.....
Average monthly	4,888,235	5,042,927	3,878,865	.....

*Includes boiler fuel, coal coked and local sales.
† Figures supplied by Central Pennsylvania Coal Producers' Association.

New Tidewater Exchange Pool Separates Pittsburgh and Sewickley Coal

AN ANNOUNCEMENT issued Dec. 16 by the Tidewater Coal Exchange, Inc., Grand Central Palace, New York City, states that the Executive Committee has authorized the creation of a new pool to be known as 63, 64 and 35, for the three sizes of coal, ¾-in., run of mine and slack, in which will be placed all mines working exclusively the Pittsburgh and Redstone seams of hard-structure gas-producing coal, as it is recognized that mines shipping this coal should be separated from mines working the Sewickley, Kittanning and Freeport veins, on account of the difference in character of the two coals and the purposes for which they are used.

J. W. Howe, commissioner, advises that the exchange will receive applications on Forms 24 and 25, for the reclassification of mines into the new pool.

New pools 53, 54 and 35 have been authorized, into which all mines now in pools 34 and 44 that are working the Sewickley, Kittanning or Freeport veins and shipping well-prepared coal will be promoted on application and qualification therefor.

Anthracite Shipments Receded in November Because of Holidays

SHIPMENTS of anthracite in November, as reported to the Anthracite Bureau of Information, amounted to 5,765,347 gross tons, against 6,240,901 tons in October, a decrease of 475,554 tons. The decrease was due entirely to the fewer number of working days in November, as, because of election day and holidays last month the collieries were operated only twenty-one days, whereas in October there were twenty-four days of active operation. For each working day in November the average shipments were 274,540 tons, as compared with 260,033 tons in October.

Shipments by originating carriers were as follows, in gross tons:

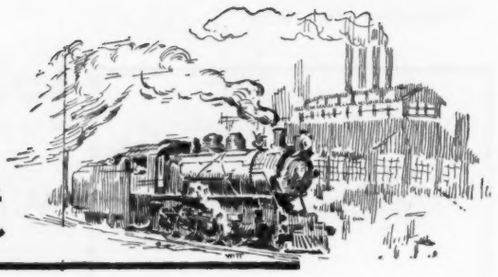
Railroads.	November, 1920	October, 1920
Philadelphia & Reading	1,238,994	1,317,070
Lehigh Valley	1,002,329	1,180,270
New Jersey Central	453,139	486,609
Lackawanna	792,157	846,054
Delaware & Hudson	814,167	893,058
Pennsylvania	424,745	484,940
Erie	603,766	531,598
New York, Ontario & Western	175,074	190,958
Lehigh & New England	260,976	310,344
Totals	5,765,347	6,240,901

Average Daily Coal Receipts at Italian Ports in Vessels Controlled by Italian Government

(In Metric Tons)

	September, 1920	October, 1920	November, 1920
Savona	1,429	1,021	1 033
Spezia	1,408	....	1,090
Messina	1,378	....	1 004
Leghorn	1,272	955	892
Civitavecchia	1,244	1,010	921
Genoa	1,189	1,066	1 129
Trieste	1,110	1,255	1,389
Ancona	942	868	889
Venice	779	789	.....
Brindisi	773	....	....
Palermo	731	932	876
Catania	717	818	.....
Bari	680	....	....
Torre Annunziata	....	1,254	1 036
Naples	....	1,067	1 096
Barletta	....	689	.....

Production and the Market



Weekly Review

WITH full coal bins the country is biding its time over the holiday period and the coal market is nearly stationary. Bottom prices having been reached in most markets, prices are holding firm in the Middle West, with some slight gains on best grades in New England. Everyone appears to be waiting for an expected "pick up" after the holidays are over.

There is little to indicate that industry will be back in the market for more than ordinary day-to-day requirements, which with the retailer demand during cold weather will sustain the market at approximately the level it holds today.

Promised Slump Is Likely To Be Severe

The apparently universal desire on the part of shippers to move coal at any price is held to account for the unusual rate of output in the face of falling prices. Coal is being forced on contracts to such an extent that the slump, when it comes, will inevitably be severe. The stage is being set by the operators and shippers for a contract season in which every phase will be against them.

Small high-cost mines have largely ceased operation, but this fact is having no effect on the total production as the cars and labor go to the larger lower-cost mines. This accounts in part for the volume of output at lower price levels, for the larger companies all through the period of shortage have said that they were being deprived of an opportunity to meet their obligations by the spreading of car supply among so many small producers.

Because of the inactive market many producers have seized upon the opportunity presented by the holidays and have closed their operations until the first of the year. This may have some effect upon the demand immediately after New Year's, which, however, will be only temporary.

Exports show a slight recovery, due, it is said, to more inquiry from abroad. The movement offshore is as yet largely confined to contract coal, however.

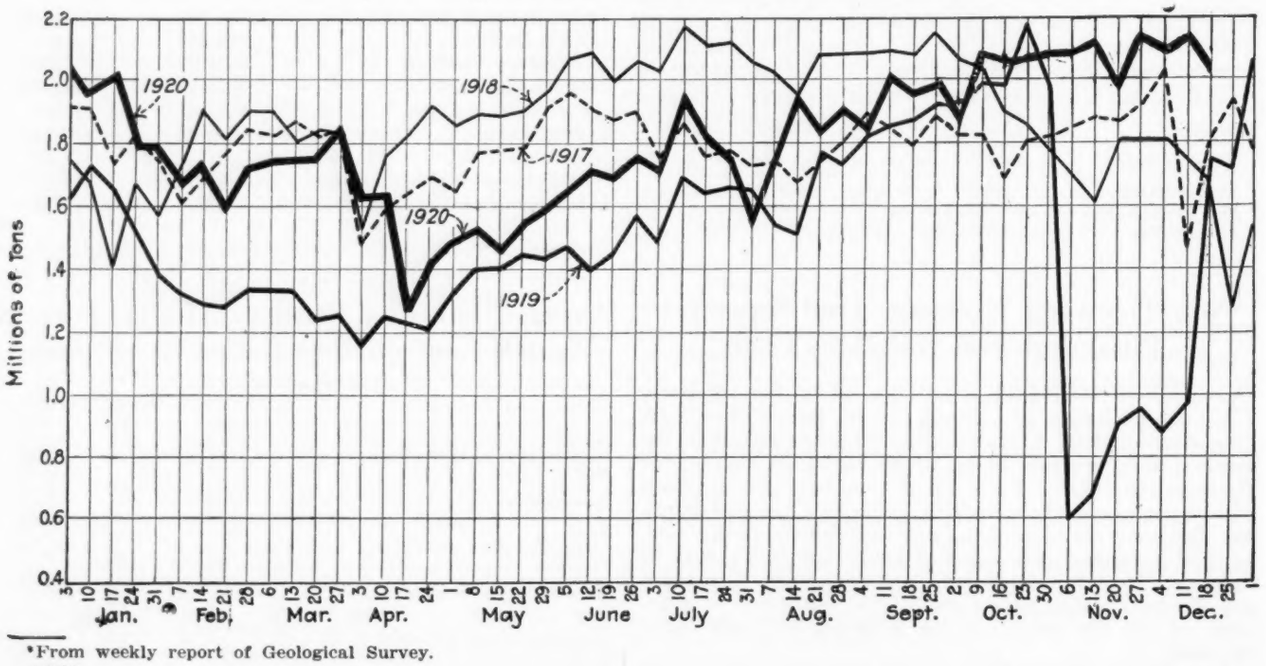
The country is eagerly watching developments at Washington, where Senator Calder is probing into the coal situation. It is inferred that some buyers are holding off waiting for the outcome of this investigation.

New England deliveries were well maintained, from which it may be assumed that not much difficulty is being experienced in moving the better grades, as the poorer coals show a continued tendency to decline while good fuels, as stated above, are firm or in some cases even show a slight advance in price.

Danger of Anthracite Shortage Averted

Anthracite production continues to be fairly well maintained. Movement is good and some retail stocks are being accumulated. Distribution is being carefully watched and preference given to districts where the supply is low. Eastern centers are well taken care of and all dangers of a hard-coal shortage have been

Daily Average Production of Bituminous Coal*



*From weekly report of Geological Survey.

averted. Domestic sizes of independent producers are softening, as low as $10.25 being quoted during the week ended Dec. 25, or a decline of almost $2 from the preceding week. Company schedules are being maintained. Steam sizes are easy as to price and while the companies are finding a ready market the independent product is hard to move and the latters' prices have declined accordingly.

Coke Market Dull; Output Curtailed

The coke market is especially restricted. In lieu of any demand operators are doing the natural thing—either suspending operations entirely or curtailing their output to the point of contract requirements not yet suspended. There are many cars of unconsigned coke on track in the Connellsville region due to suspension of contract shipments. Operators are simply playing a waiting game until the steel trade completes its readjustment in the hope that coke will again assume its important position.

BITUMINOUS

Production for the week ended Dec. 18 amounted to 12,184,000 net tons, according to the Geological Survey, a decline of 681,000 tons as compared with the preceding week. However, the production rate is still ahead of that for the same period in any of the last three years. Loadings on the opening days of the week of Dec. 19-25 were well maintained, but production was much curtailed during the latter part of the week, owing to the beginning of the holiday season. These holidays and the fact that many operators are closing their mines until after New Year's will doubtless reduce the week's output below the 10,000,000-ton mark.

It may be said that car-shortage losses are now less than those from no-market sources. Production is still suffering from poor placements in the Middle Appalachian section but elsewhere the car supply is generally reported as fairly satisfactory, in fact, a good many fields are unable to use all the empties placed at their disposal.

Mining labor is plentiful and the influx of new men from other industries continues. The situation in the troubled areas is becoming more settled; Alabama producers are finding that the strike is no bar to production in their district, while the presence of Federal troops in the Williamson fields continues to exert a peaceful influence there.

Spot Prices Seem To Have Touched Bottom

Quotations for spot coal show a still lower range for the week ended Dec. 18, having apparently touched bottom. Consumption of steam coal is still curtailed by the industrial contraction, buyers being on the market on a daily requirement basis only. Cancellations are numerous, in many instances being received while the coal is en route, which with efforts to move coal by consignment have resulted in sales being forced, to the detriment of operators. Export business was extremely sluggish although considerable tonnage is moving on contract. Coal is accumulating at Tide and whatever new overseas business is being transacted goes at very little premium over inland quotations, a range of $13.75@$15 c.i.f. being reported.

The following table shows the trend in the spot steam market (mine run basis, net tons, f.o.b. mines):

	Nov., 1919*	May, 1920	Aug. 5, 1920	Dec. 16, 1920	Dec. 23, 1920	Dec. 30 1920†
Pittsburgh steam	$2.35	$4.00	$10.00	$3.75	$3.25	*$2.75*
Pittsburgh screened gas	2.35	4.50	12.00	4.50	3.75	*3.25*
Hocking	2.50	4.75	9.00	3.75	3.00	*2.50*
Franklin, Ill	2.35	3.75	6.50	4.00	3.40	3.40
Indiana 4th vein	2.35	3.40	7.50	3.25	3.25	3.25
Eastern Ohio, No. 8	2.35	4.50	10.50	4.00	3.40	*3.00*
Fairmont	2.50	6.75	13.50	3.75	3.00	*2.75*
Kanawha	2.60	6.75	14.00	4.50	3.50	*3.00*
S. E. Kentucky	3.00	6.00	10.50	4.75	4.00	*3.40*
Western Kentucky	2.35	3.50	5.25	4.00	3.75	*2.75*
Clearfield	2.95	6.25	12.00	4.75	3.75	3.75
Cambria and Somerset	2.95	6.75	13.50	6.00	4.75	*4.65*
New River	2.70	6.50	14.00	5.00	5.00	*4.75*
Pocahontas	2.35					

* Government prices.
† Advance over the previous week shown in **heavy type**, declines in *italics*.

Estimates of Production

(NET TONS)

BITUMINOUS COAL

Total bituminous, including coal coked

	1920 Week	1920 Calendar Year to Date	1919 a Week	1919 a Calendar Year to Date
Dec. 4b	12,832,000	512,538,000	5,245,000	425,291,000
Daily average	2,139,000	1,789,000	874,000	1,480,000
Dec. 11d	12,865,000	525,403,000	5,800,000	431,091,000
Daily average	2,144,000	1,799,000	967,000	1,469,000
Dec 18d	12,184,000	537,582,000	10,431,000	441,522,000
Daily average	2,030,667	1,800,000	1 738,000	1,470,000

(a) Less one day's production during New Year's week to equalize number of days covered for the two years. (b) Revised from last report. (d) Subject to revision.

ANTHRACITE

	1920 Week	1920 Coal Year to Date	1919 a Week	1919 a Coal Year, to Date
Dec. 4	2,051,000	61,024,000b	2,014,000	63,474,000b
Dec. 11	1,915,000	62,939,000b	2,120,000	65,594,000b
Dec. 18	1,979,000	64,918,000	1,727,000b	67,321,000b

(a) Less 2 days' production during first week of April, to equalize number of working days covered for the 2 years. (b) Revised to agree with Weekly Report No. 178, pages 2 and 7.

BEEHIVE COKE

United States Total

Week Ended Dec. 18c 1920	Week Ended Dec. 11 1920	Week Ended Dec. 20 1919	1920 to Date	1919a to Date
333,000	374,000	386,000	20,274,000	19,026,000

(a) Less one day's production during New Year's week to equalize number of days covered for the two years. (c) Subject to revision.

Tidewater movement for the week ended Dec. 19 is estimated by the Geological Survey at 947,000 net tons, a decline of almost 100,000 tons from the preceding week. However, exports showed a slight gain, 393,000 tons being moved. Coastwise movement to New England totaled 198,000 tons as compared with 226,000 tons during the preceding week.

All-rail shipments to New England via the five rail gateways amounted to 5,222 cars during the week ended Dec. 18, or practically the same as the movement for the week ended Dec. 11.

ANTHRACITE

Production increased 64,000 tons during the week ended Dec. 18. According to the Geological Survey 1,979,000 net tons were produced during that period. Domestic sizes are still eagerly sought at company figures, but some effort is required to move the higher-priced independent product. As a result these prices have declined about $2 during the week, being now generally quoted around the $10-mark. Independent steam quotations are practically down to the level maintained by the larger companies and these grades are becoming increasingly difficult to move.

The Middle West still complains over the hard-coal shortage, although no suffering has resulted from the meager Western shipments. Coal is being carefully distributed to points where the need is greatest and there is no longer any difficulty in obtaining supplies in such centers as New York, Philadelphia, Baltimore, etc.

COKE

Production of beehive coke during the week ended Dec. 18 is estimated at 333,000 net tons by the Geological Survey. The decline of 41,000 tons as compared with production for the preceding week reflects the extremely sluggish market which has resulted in many producers ceasing operations, temporarily at least. Production also has been curtailed to offset the lower call. More first-half contracts for furnace coke have been made on a five to one ratio basis. Spot quotations range $5.25@$5.75 for furnace, a decline of 25c., while foundry coke is firm, $7@$7.50.

Cumulative production for the year has reached a total of 20,274,000 net tons, over a million and one-quarter tons in excess of that of 1919.

Reports From the Market Centers

New England

BOSTON

Market Extremely Dull — Movement Slackens — Railroads Cease Buying — Only Light Business at Tide — Anthracite Shipments Increase — Retail Demand Light.

Bituminous—In all directions receipts have dropped notably. Railroads have still further curtailed service. At Tidewater re-handlers find themselves put to it to store coal they are under contract obligation to receive. It might be supposed that with all the surplus available at various distributing points there would be a pronounced weakening in prices of Pocahontas and New River, but factors are realizing that low prices today are not of themselves any inducement.

Contracts naturally are being filled up to the mark and there is little chance of railroad purchases in any volume until prices are made for next season. As in the case of other consumers the railroads have larger stocks than anticipated and beyond that they are committed to take more coal the next three months than present traffic conditions would warrant.

At the New York and Philadelphia piers there is still in evidence a lot of distress coal. Forced sales made on this account for many of the very lowest figures rumored. At Hampton Roads the supply is so much greater than can be readily absorbed that drastic embargoes probably will soon be put into effect. Only those shippers who made contracts for a large proportion of estimated tonnage are now able to lift coal with reasonable promptness. In New England there are at most only two or three buyers who are interested in smokeless coals by cargo and these have the spot market almost at their command. Figures much less than $8 per gross ton f.o.b. Norfolk have been verified and when it is realized that this means less than $4.50 net at the mines it will be seen that the smokeless coals are going into the same decline that prevails on Pool 1 from Pennsylvania and Maryland.

Current quotations on bituminous at wholesale range about as follows:

	Clearfield	Cambrias and Somersets
F.o.b. mines, per net ton	$2 85@4 60	$4 10@5 25
F.o.b. Philadelphia, per gross ton	5 85@7 80	7 26@8 45
F.o.b. New York, per gross ton	6 35@8 30	7 75@9 00

Pocahontas and New River are quoted at $7.75@$8.25 per gross ton f.o.b. Norfolk or Newport News, Va.

Anthracite — While stocks are still very low in most parts of this territory it is now clear the corner has at last been turned. Producing companies who have had less regular connections with this market are offering coal and the independents themselves have marked off the asking price from $15 to around $12. Naturally credit is being taken by fair price committees and other quasi-public agencies, but the fact remains that the supply is at last catching up with the demand.

A number of dealers report very little new business and it is now being stated that the continued mild weather has probably made up for the mine-workers vacation in September. In any case, we shall soon see an easy market on domestic sizes. The steam sizes are literally going begging.

Tidewater—East

PHILADELPHIA

Despite Moderate Demand Dealers Seek More Anthracite—Prices Seem Fixed—Steam Coals Move Slowly—Bituminous in Light Demand—Prices Close to Bottom—Coke Quiet.

Anthracite — With production continuing close to normal it is becoming a source of wonderment as to just where the coal is all going. There is still a feeling that a break will come in the market at a time least expected, yet there is no evidence of such an event at this moment. A fair volume of coal has rolled into the city recently, although somewhat reduced over the previous two weeks. Coal merchants in the outlying section of the state are now moving the biggest tonnage they have had since the strike diverted heavy shipments to them last spring.

Despite the various adjustments by both company and individual shippers increasing prices, the retail trade has in no way advanced its schedule. Most retail figures are covered in the scale from $14.75@$15.25 for egg, stove and nut, per gross ton, with an extra charge of 50c. where chuted into cellars. Pea averages about $12 a ton.

Steam continues in a rather uncertain state, especially as to the independents. Some of the latter shippers barely have enough orders for a week ahead and at times they are on the market with shaded prices. Buckwheat is as low as $3.50. The companies are able to move buckwheat fairly well and so far the entire production is going into the market.

It is not believed that there will be any change in the company prices for the first of the year and the figures therefore should be as follows per gross ton for line trade and f.o.b. Port Richmond for Tide:

	Line.	Tide.
Broken	$7.75	$10.45
Egg	7.75	10.45
Stove	7.95	10.60
Nut	7.95	10.60
Pea	6.40	8.80
Buckwheat	4.25	6.75
Rice	3.15	5.60
Boiler	2.50	4.90
Barley	2.25	4.65
Culm	1.50	3.50

Bituminous—It is difficult to see how prices for good fuels could really go any lower, yet the buying is of an extraordinarily light nature. Industry shows no sign whatever of picking up. In many instances prices of good fuels are close to the bottom, yet buyers have such heavy stocks that it only increases their burden to add to them. The only buyer is the small consumer, usually without contract protection and who buys a car as he needs it.

Spot prices net at mines are about as follows: Pool 1, $5.25; Pool 9, $4.75; Pool 10, $4@$4.25; Pool 11, $3.50@$3.75. There are actually lower prices than these, all depending on how anxious a shipper is to market his coal. Others it would appear prefer to curtail production rather than go much lower. On the Fairmont gas coals of the Pool 34 classification the average price is about $2.75 and Pool 44, as one shipper put it, "can be had for almost any price," which means that it has about lost its market.

Some contracting is taking place and it would seem that the pressure is now coming from the producer, although the consumer continues to show interest at least to the extent of making inquiries. A price of $4.50 for the good steam coals seems to about fit the producer idea of a contract basis, but we believe there is some business actually closed on fair coals around $4.

BALTIMORE

Immediate Market Is Flat — Holiday Rest Period Likely To Lighten the Market—Export Outlook Improving—Hard Coal Run Continues Good.

Bituminous—The old year is dying with business more or less demoralized, reflected in the low demand for all classes of commercial fuels. For the time being, demand has dropped off for both immediate and future delivery, and prices have sagged heavily.

The holiday rest period at the mines is likely to cause some little tightening. On the other hand, the car supply has greatly improved, until it is running between 70 and 80 per cent in western Maryland and West Virginia fields that ship this way. The over-holiday accumulation of cars will probably mean an almost one hundred per cent run the early part of January. At this writing, production on the B. & O. is averaging close to 4,000 cars per day, the best in some weeks.

The reserve at Tide has increased, running at both B. & O. and Pennsylvania piers about 2,000 cars daily in the pool, and is likely to run higher as the daily run to Tide now is considerably

in excess of the dumpings over the piers each day of about 400 cars only. Prices at Tide and the mines remain about as last quoted on gas coals, around $7.50@$7.75 for best coals net ton f.o.b. piers, and as low as $6 for Pool 34. Steam coals are still being quoted f.o.b. mines net ton at about $5 for selects, $4@$4.50 for intermediate grades and as low as $3.25@$3.50 for such fuels as run to Pool 18.

The export outlook continues to improve. A growing number of charters is reported. In addition there are strong intimations here that Europe has been holding back for lower prices on this side and as soon as it becomes evident to them that the bottom has been reached there will be a rush of orders again. Meanwhile the export movement is likely to run around 230,000 tons on cargo coal for December.

Anthracite—The run of hard coal continues good, the first three weeks of December seeing a shipment of around 50,000 tons. No very severe weather has come to this section so far, and the supply of urgent cases has been made. The balance of the winter, unless unusually hard conditions come in January and February, is likely to be more or less uneventful.

NEW YORK

Anthracite Moves Quickly and Demand Is Less Urgent—Steam Coals Plentiful and Hard To Move — Bituminous Demand Slow—Lower Grades Show Further Slump.

Anthracite—With the danger of further shortage practically over the trade at last breathes easier. Production is not expected to be up to the past few weeks' performance because of the holiday season but should be sufficient to take care of immediate requirements. Nearly every dealer has some coal in his bins and his customers' orders are pretty well cleared up.

There is a ready market for all domestic coals. Some independent operators who have no ready market for pea are asking buyers of the larger sizes to absorb some of the smaller coal. The market for the domestic sizes has practically developed into one of supply and demand so far as the product of the smaller operators is concerned.

Not much is heard of high-priced coal. Buyers are more conservative and are ready to wait rather than pay quotations now asked by some of the small operators. The average independent sale was thought to be below $11.

Market for the steam is slow. Independent buckwheat is not much in demand and better grades were quoted $3.50@$3.75. Rice was $2@$2.75, and barley around $1, some sales being reported at lower figures.

Bituminous—The industry was practically at a standstill last week. Movement was slow and demand practically nil. Tonnage available at local piers increased considerably, the Tidewater Coal Exchange reporting 2,000 cars on hand on Dec. 23 as compared with about 1,800 on Dec. 16.

A reduced production was naturally to be expected during the holiday period which might result in a slight stiffening of market conditions. However, with most bins filled to at least 90 per cent of capacity no great increase in demand was expected.

There is no demand along the line, conditions being similar to those prevailing at seaboard. Some shippers are offering coal loaded in cars along the mine sidings. The lower grades took another slide during the week, but notwithstanding this buyers were willing to take the better coals at slightly higher prices. Railroads were active and took a good tonnage. Exporters report no demand, but the bunker trade is fairly strong.

Local boat-owners are facing trouble with their employees, demand having been made for an increase in wages. Loaded boats are plentiful, and are being offered at concession.

Quotations for the different pools were varied, changing within the 24 hours in some instances. Pool 10 was $3.50@$4; Pool 11 around $3 and Pools 18 and 34 around $2.50. Good grades of unclassified coal were quoted $4@$4.50.

BUFFALO

Bituminous Prices Close to Bottom—Demand Not Improving—Consignments Heavy—Anthracite Improves Slowly.

Bituminous—The situation does not improve. Shippers have made that impossible by sending out cars that were not sold, only to see them stand on track and pay demurrage. Then some contracts have been over-shipped and that coal has been rejected.

Quite a good many small mines are already idle. The consumers are as indifferent to the market as ever, few of them buying unless solicited in person and not much then. Jobbers say that it is quite useless to send out circulars, so they have put their men on the road.

Prices are unsteady, but may be summarized at $5@$5.50 for Youghiogheny gas, $4@$4.50 for Pittsburgh lump, $3.75@$4 for all mine run and $3.25@$3.50 for slack, to which add $2.36 for Allegheny Valley and $2.51 for Pittsburgh to cover freight.

Anthracite—The supply is better than it was although not up to expectations. This would naturally be the time for filling the city up with coal that is shut off from the Lakes. No doubt that is done to a considerable extent, but the output is not what it was expected to be. On that account the supply will have to be handled with more caution than is usually the case.

Besides that the Buffalo natural gas supply has dropped off so that at every sign of winter a swarm of coal consumers appears at the retail offices. The rule is to supply a load at a time now to keep everybody going.

Shippers and retailers do not forget that there was a time early in the summer when orders were scarce and they claim that they could have delivered more coal if it had been asked for, but it remains for all that a fact that some consumers had unfilled orders from June to fall. Canadian retailers are still after coal.

Coke—The trade is light and will remain so for the present, as the ovens are now amply able to fill all their contracts. Jobbers quote 72-hour Connellsville foundry at $7, 48-hour furnace at $6 and off-grades and stock at $5; domestic sizes are $7.50 for beehive lump, $10.50 for local by-product and 75c. for breeze, all taking a $3.64 freight rate to Buffalo, except the local product, which is paying 52½c.

Northwest

MINNEAPOLIS

Seasonable Weather Checks Price Decline—All-Rail Coal in Good Supply—Dock Stocks Freely Offered.

The market has been balancing on the edge of a slump for some time. The all-rail market has been slipping fast, especially on the lower grades. Even the arrival of some zero weather was not sufficient to more than check it. A continuation of really seasonable weather will undoubtedly cause prices to stabilize. Estimates by various coal companies are that there has been a reduction of sales during the past four months of from 20 to 30 per cent.

So regardless of what the coming days may have as to weather, to date there has been a sharp cutting down of consumption which will count against the season's total. All fear of any real shortage this winter has passed. The service from Illinois mines has been too good, and cars are too plentiful to make the trade dependent wholly upon the dock stocks.

As a result, the higher dock prices have begun to yield, and there is a reduction of $1@$2 on the higher grades of Eastern soft coal. It is hard to give a market when there has been a range from $8.90@$14 on the same grades of dock coal. All dock companies are more ready to sell, for the expected shortage has practically been overcome, and it is not necessary to conserve all the coal held to protect the established trade.

It does not yet seem likely that there will be any real surplus of dock coal at the end of the season. Should the next three months be as unseasonably mild as were the last three, there will doubtless be a surplus which can only be averted by making inducements in lower prices. Even that is a very uncertain method. The only effect of a cut price is to take business away from another source, which naturally results in the losing party returning the favor as soon as possible.

The market continues to be wholly a weather one, and will rest upon the character of weather as to whether it is firm or weak. Members in the trade hold that they are being unjustly assailed in the reckless charges of profiteering which are being disseminated.

But that cannot be helped, for the coal business has been in disrepute with the public for a long time. So far as public sentiment can influence it, and that goes quite a ways, prices will be under a depressing influence. The weight of the limited consumption during the past three months, will add to it. Unless there be strong support from winter weather during the next five or six weeks, the best that can be hoped for is an uncertain market. This applies particularly to soft coal. Hard coal is more dependent upon domestic needs, and from this time on, consumption will be fairly stable, even though there be no severe weather.

MILWAUKEE

Market Is Very Dull — Hard and Soft Coal Easily Obtainable—All-Rail Coals Much Weaker.

Dealers are doing practically nothing and do not look for anything different until cold weather sets in and forces a more rapid consumption of stocks on hand. Anthracite is now in liberal supply and can be obtained in any quantity, as can also all grades of Pocahontas. There is a steady supply of the latter coming by rail. Pea and buckwheat, which were very scarce a short time ago, are now being delivered in satisfactory volume.

Prices on all coals are firmly held, but it becomes more evident every day that soft coal cannot be held much longer at the schedule now in force. The cut in Illinois coal is bound to undermine this market before spring. Coal at Illinois mines is now being offered $3.75@$4. After paying railroad freight rates there is a worth-while margin under Eastern coal at interior points. The City of Milwaukee is selling coal at cost to the needy at a number of stations in various parts of the city. Most of it is going out in 50-pound lots.

Inland West

CLEVELAND

Pronounced Weakness Develops—Cancellations Increase — Mines Closed for Holidays — Anthracite and Pocahontas Continue Scarce.

Bituminous — Pronounced weakness, which has been developing in the coal trade, has during the past ten days taken a disturbing turn. Operators are now face to face with an epidemic of cancellations. Coal which a short time ago was under contract at $7@$8, is now in little demand at $3.50@$4.50.

Steam coal can now be obtained at eastern Ohio mines under $3.75 for ¾-in. lump and under $3 for minue run and slack. Prices are unsettled and further declines would not be surprising.

Retail dealers, however, are still adhering to established price schedules. The demand was apparently stimulated but little by a few days of cold weather, followed immediately by warmer temperatures and rain.

Some of the Ohio mines are now down for the holidays and will not reopen until after the first of the year. Operators are asserting that present prices are below the cost of production, and they prefer to close down rather than operate. Car supply, under present conditions, is more than adequate.

Retail prices, delivered in Cleveland are:

Anthracite — Egg, chestnut and stove, $15.45.

Pocahontas—Shoveled lump, $12.35; mine run, $11.30.

Domestic Bituminous — West Virginia splint, $11.75; No. 8, $9.30; cannel lump, $15.

Steam Coal—No. 6 and No. 8 slack, $8@$9; No. 6 and No. 8 mine run, $9; No. 8, ¾-in. lump, $9.30.

Anthracite and Pocahontas—The supply of anthracite continues to be far short of requirements. Retail dealers apportion it out in small quantities with corresponding quantities of coke. Pocahontas, although arriving in slightly increased volume, is still scarce.

Receipts of industrial and retail coal for the week ended Dec. 18 were: Industrial 1,800 cars, retail 630 cars, the former being 200 cars under, while the latter is 100 cars above the preceding week.

MID WEST REVIEW

Seasonable Weather Strengthens Market—Prices Steady—Cancellation Evil Growing — Cars Are Plentiful — Mines Closing for Holidays.

While there have been but few sales of any consequence made during the last week, the market is in a little better shape than it was two weeks ago. Weather conditions are more favorable, which doubtless reminds people that coal must be purchased if they are to be kept warm.

The trade realizes pretty well by now that selling coal is not a matter of price, but of finding a person who is in the market. Wise operators have given up their endeavors to sell steam on an open market. They have come to the conclusion that it is a far wiser plan to store the coal adjacent to their mines and to wait until conditions become more settled before they try to find a market for it. Operators, who through local conditions are unable to store their coal, have either closed their mines for the holidays or are forced to sell at a very low figure. Salesmen all through the territory have been recalled until after the first of the year.

There are so many cancellations and the practice is now so widespread that it is only a question of time before something will have to be done to put an end to this evil. Some operators are refusing point blank to accept cancellations.

A number of Chicago wholesalers are finding themselves in serious difficulties. During the summer months they signed contracts for the output of various mines, running anywhere from a year to eighteen months. The coal of course, had to be purchased at prices prevailing last summer and these were very much higher than those of today. One wholesaler who, in this manner, took the output of a southern Illinois mine is now faced with a loss of practically $1.25 a ton on a thousand tons a day.

Mines both in Indiana and Illinois have received as many cars as they have need for, and in a great many cases more than they can use. Railroads are now in a position to give very satisfactory service to the mines because they have very little else to do since freight traffic is practically at a standstill.

Current prices are as follows:

Southern Illinois (Franklin, Saline and Williamson Counties):	
Prepared sizes	$3.50@$5.00
Mine run	3.00@ 3.75
Screenings	2.25@ 3.00
Central Illinois (Springfield District):	
Prepared sizes	$3.25@$4.25
Mine run	2.00@ 3.00
Screenings	1.50@ 2.25
Northern Illinois:	
Prepared sizes	$4.00@$5.00
Mine run	3.25@ 3.75
Screenings (washed)	3.00@ 3.50

Indiana (Clinton and Linton, Fourth Vein):	Outside State	Inside State
Prepared sizes	$4.00@$4.75	$3.45
Mine run	3.00@ 3.50	3.20
Screenings	2.25@ 2.75	3.00

Indiana (Knox County, Fifth Vein):	Outside State	Inside State
Prepared sizes	$3.50@$5.00	$3.25
Mine run	2.00@ 3.00	3.00
Screenings	1.50@ 2.75	2.80

Pocahontas and New River:	
Prepared sizes	$6 00@$7.25
Mine run	4 50@ 5.00
Hazard and Harlan (Southeastern Kentucky):	
Block	$6 25@$7.00

COLUMBUS

Trade Shows Considerable Softness, Especially in Steam — Production Continues Good—Cancellations Are Heavy.

Weakness characterizes the Ohio coal trade in all fields. Since the closing of the Lakes a large domestic tonnage has been moving to the retailers with the result that this demand is satisfied and a number of cancellations have been received.

Retail prices are still slumping. Hocking lump retails $7.75@$8.50 and in some cases lower. Mine run from all Ohio fields is $5.40@$6.25. West Virginia prices show splints selling $8 @$8.75 and Pocahontas around $10. Kentucky grades are $8.50@$9.25.

Steam trade is slow in every particular. Reserve stocks are now large and purchasers are not inclined to buy for the future. The tendency on steam grades is still downward, although some producers profess to believe that the bottom has been reached.

Production has been rather good in all districts although a large number of small mines have been closed. In some instances a few of the larger mines have been closed for lack of orders. There is still a considerable amount of coal on track, caused by wholesale cancellations and this is being offered at extremely low prices.

Prices at the mines for the principal coals used in central Ohio are:

Hocking lump	$4.00@$5.00
Hocking mine run	2.25@ 2.75
Hocking screenings	2.00@ 2.50
Pomeroy lump	450@ 5.00
Pomeroy mine run	2.50@ 3.00
Pomeroy screenings	2.25@ 2.75
West Virginia splints lump	4.50@ 5.25
West Virginia Splints mine run	2.50@ 3.25
West Virginia splints screenings	2.25@ 3.00
Kentucky lump	4.25@ 5.00
Pocahontas lump	5.50@ 6.25

DETROIT

Greatly Reduced Demand for Steam—Cold Weather Stabilizes Domestic Trade—Anthracite Shipments Still Irregular.

Bituminous—Buyers are not coming into the local market very actively. It is becoming rather difficult to make sales of either steam or domestic. Quite a number of large consumers of steam coal are practically out of the market and are receiving only contract shipments, while others are either depending on their reserves or are buying only in quantities sufficient to satisfy current requirements.

Domestic demand has been rendered sluggish by the long period of warm weather. Colder weather now here, has not continued long enough for its effect to be noted. As few retailers are carrying stocks of much size, the jobbers feel certain a larger volume of business will develop in the near future.

For West Virginia lump the mine price is $5.75; mine run is $3.75 and slack $3@$3.50. Hocking domestic lump is $5.75 while either mine run or slack is available at about $3.25. Pocahontas lump is not plentiful and is bringing about $8, mine run is $6.

Anthracite — Shipments are still irregular and of small size. Retailers have no stocks adequate for their needs in meeting an active demand and frequently are obliged to supply coke or bituminous in filling orders.

CHICAGO

Cold Weather Stimulates Domestic—Trade To Fight Proposed License Ordinance — Signs of Industrial Resumption.

A spell of cold weather has stimulated to some small extent, the domestic market but this stimulation has not been strong enough to make very much difference in the situation. Domestic sizes are holding fairly firm but steam continues extremely weak. There are some stories going the rounds that central Illinois screenings, as well as Standard screenings, have been selling 50c.@75c. per ton, but these figures are misleading as they are not the prices prevailing on the bulk of the tonnage from the two fields.

The Chicago coal trade is up in arms over a proposed city ordinance. The city finds itself in financial straits and to relieve the situation, an ordinance has been proposed licensing wholesalers, jobbers and brokers. The coal industry in Chicago does not have the highest confidence in the present city administration.

ST. LOUIS

No Demand for Either Steam or Domestic—All Fields Running Short Time —"No Market" Losses Heavy.

With mild weather prevailing the price still continues to drop. Steam plants have let up buying, and this has seriously affected the steam market from all fields. As a result, many mines have been idle on account of their failure to move production. Even the country demand has almost disappeared.

Railroads are taking a good tonnage, which is the only thing that is saving the Standard and Mt. Olive fields. This also affects the tonnage from the Carterville field. Domestic business is nearly at a standstill. Everybody is waiting for an expected decrease in retail prices after the first of the year. Prices in St. Louis, however, are based on old contract figures made last spring, and while the open market at the present time is low, it does not begin to compare with contract prices, and as a result there can be no immediate reduction in retail prices.

Mines in Standard field are running two to two and a half days a week on domestic coal, having little market for the tonnage. In the Mt. Olive fields somewhat similar conditions exist. The car supply is good and there are no labor troubles.

In the Carterville field a few reports have come through of mines having no market for steam sizes. Other than that, everything has been reported as unusually good. Larger operators are maintaining their circular prices, while the independents are down to $4@$4.50 on domestic sizes, and screenings, $2.25, with mine run $2.75@$3. Working time is averaging four to five days per week.

CINCINNATI

Market at Standstill — Mine Operating Conditions Are Good — Prices Weaken.

Virtual standstill in the market is reported at the present time. The shut down of many plants has made the steam demand very easy and only enough coal is being received to meet contract demands. Lack of severe weather has caused a decided slump in the demand for domestic.

Car supply as a whole has improved, although continued trouble is being experienced on the C. & O., due to lack of motive power. Conditions on the N. & W. and the B. & O. roads are better, the supply of cars having reached 85 per cent of normal.

Many of the mines have shut down during the holiday season, owing to the light demand. Belief is expressed that with the coming of spring conditions will improve to a certain degree, with the re-opening of plants whose operations are now suspended.

Bituminous lump f.o.b. mines ranged $5.15@$6, with mine run $4. Smokeless coals, for which the demand in the East has reduced considerably, was quoted $4.80@$5.25 for lump while mine run was anywhere from $4.50 up. No change was noted in the retail prices.

South

LOUISVILLE

Light Demand for All Grades — Prices Dropping—Rail Congestion in Eastern Kentucky—Production Slumps.

The decline in the past two weeks has continued until selling coal is a job which requires brains and knowledge of the business. It has been so long since it has been a buyers market that many coal men have almost forgotten how to sell.

Right now there is a little coal moving to the southern and southeastern railroads. There is some little movement to gas and byproduct plants, and gas coal is selling more easily than other grades. Retailers are taking very little fuel.

Several large corporation mines are now selling a good deal of their production on open markets, being unable to consume it themselves. The Ford mines in southeastern Kentucky have been selling coal on the open market for some weeks. Retailers are failing to meet reductions in mine prices in their quotations to consumers, which is making for slow retail sales.

Eastern Kentucky mine quotations show: Lump, $5@$5.50; mine run, $3.25@$3.50; screenings, $2.50@$2.75. Eastern Kentucky railroads are so choked with cars that distribution is poor, it being a hard matter to handle loaded cars out with the big supply of empties on hand.

Retailers are asking $8.50@$8.75 for Western Kentucky lump, and $10@$12 for eastern Kentucky. Western Kentucky mine run is $7.50; nut, $8.25; screenings, $6.75.

BIRMINGHAM

Demand Is Mild — Prices Remain Unchanged — Surplus in Low Grades — Labor Supply Good, but Working Irregularly.

There continues a very heavy movement of commercial coal, furnaces and railroads also accumulating good stocks. Low grade coals are not finding a ready disposition and there is a surplus of Big Seam and other coals of similar quality. The output of Black Creek, Cahaba, Pratt, etc., is being taken care of without much difficulty, though there is no insistent demand from any quarter. Quotations remain in line with those of the past several weeks.

Car supply has been good for the past week with the exception of the L. & N., which has been furnishing from 40 to 50 per cent for the past three weeks. There is plenty of labor at this time and the output is greater than trade requirements. However, there is a shortage of strictly domestic grades, a condition which has existed throughout the year. The output for the week ended Dec. 18 was 323,406 tons, 300,000 tons being considered a normal weekly production.

Southwest

KANSAS CITY

Arkansas Operations Curtailed—Prices Are Firm—Three Indictments Returned.

There was very little change in market conditions during the past week. Kansas nut coal is moving slowly, but the first touch of winter will clean up all surplus production. In Arkansas

Conditions remain bad. The mines are working less than half time and as a result steam grades are short with some companies and long with others, and lump is almost to zero. About the only mine run that is moving is to the railroads. In Oklahoma the situation is about the same. Missouri production just about equals the demand. Prices rule about the same as last week.

The Federal Grand Jury investigation reveals sales listing at figures yielding unfair returns and three companies were indicted on charges of profiteering. These are the National Fuel Co., Laning-Harris Coal & Grain Co. and the Sheridan Coal Co. Some eighteen other companies were investigated, but no grounds for indictments were found. It would seem from the reports that the three companies mentioned were indicted for coal and petroleum coke which they purchased and resold.

West

SAN FRANCISCO

Cold Weather Increases Domestic Demand—Bunker Trade Active — Prices Are Steady.

A spell of cold weather has materially increased the demand for domestic coal. Dealers met the calls readily enough as stocks are especially good. Shipments from Utah and Wyoming continue strong with promise of ultimate relief from high freight rates. Mine prices are unchanged.

Although the number of vessels coming here for merchandise is somewhat below normal the bunkering business is in a healthy state. Almost as many large steamships call in at the Golden Gate for replenishing their coal supply while plying between Atlantic and Oriental ports, as carriers coming here for freight. The Golden Gate attracts the ships as the Utah coal supplied here is preferred as a superior bunker coal.

DENVER

Many Cancellations — Market Is Uncertain, but Price Well Maintained—Boycott Curtails Production.

The so-called buyers' boycott is running its course. Operators are taking fresh hope this week that the crisis in the boycott has about passed, and that the middle of January will find business on a much firmer basis.

Cancellation of orders is one of the things that the big companies have had to contend with, domestic users holding their coal bins to the lowest level, and retailers and jobbers in turn refusing to accept orders placed three months ago.

While unseasonable weather has been against the operators, the inroads of the buyers' boycott is seen in the output for the week ended Dec. 11, when 231,956 tons were mined of a possible 273,189 tons, compared with the previous week, when 234,358 tons of a possible output of 262,940 tons were mined. Actual production for the week ended Dec. 11 was 84.9 per cent against 89.2 per cent for the preceding week.

The market is still uncertain, some of the smaller operators trying to force down the price. Routt County and southern Colorado bituminous lump at the mine is $6@$6.50. Louisville first-grade lignite is steady at $6; Louisville second, $4.75; steam, $2.40 and bituminous steam $2.50@$3. Bituminous coking coal is $3.50. There is no indication of price revision Jan. 1.

News From the Coal Fields

EASTERN OHIO

Production Declines Slightly — Demand Very Weak—Prices Sag Further.

Production for the week ended Dec. 18 is estimated at 410,000 tons. Potential capacity of the mines included in these figures is now approximately 662,000 tons by reason of increased mine ratings effective Dec. 10.

Car supply for the week was around 65 to 70 per cent of requirements, 50 per cent supply for commercial. On Tuesday, Jan. 14, many of the mines were idle a half day on account of miners holding their election for international, district and sub-district officers.

Labor situation was somewhat better, the week being one of the quietest for some time. Some new labor is arriving, a few from Europe but most of them are drifting back to the mines from other industries.

The market continues very soft, with industrial and domestic requirements amply met. Prices for mine run and slack: $2.75@$3.25 and lump, $3.50@$4.25 f.o.b. mines.

PITTSBURGH

Demand Light and Spot Prices Still Lower — Narrow Market in Point of Tonnage—Domestic Demand Moderates.

Demand has been very light in the past week and prices have suffered a further and severe decline. Conservative coal operators hold that prices done in the open market in the past few days do not reflect real values, or suggest what the market is going to be during the remainder of the winter, for some operators refuse to meet present competitive prices and the business done really represents a very narrow market.

Demand for domestic is now only moderate, reflecting the tendency of householders for months past to lay in all or a large part of their prospective requirements. Many householders find they need to use coal only occasionally instead of regularly, because of weather conditions and good gas supply.

Demand for byproduct has fallen off rather sharply, reflecting the blowing out of many blast furnaces. While byproduct coal still brings a premium over steam this is greatly reduced. We quote the market at $2.50@$3 for steam, $3@$3.25 for screened gas and $3@$3.50 for byproduct, depending on grade and tonnage.

CENTRAL PENNSYLVANIA

Car Supply Adequate — Mines Closing Down — Prices Touch New Low Levels.

With little or no demand for coal, the situation is not helped by an adequate car supply. Many of the smaller mines in the Philipsburg and Houtzdale region have closed.

"All shot to pieces," is the way one operator in the Cambria field expresses the mining situation at the present time. The closing of many plants is given as the cause of little demand and many operations are being closed. A number of mines in Pools 11 and 18 district have closed, the price going as low as $2.50. All the mines are curtailing their product as much as possible. Pool 10 coal is selling at $3.50@$3.75 with all indications that the price will go lower. Operators say that it will be necessary to close the mines or operate at a loss.

CONNELLSVILLE

Spot Market Somewhat Easier — More Furnace Coke Contracting Done.

The spot market has become still softer. Operators who were holding out for the extreme prices have revised their views and the range of quotations is materially reduced.

In furnace coke there has arisen quite a tonnage that has been loaded so long that it is not salable to blast furnaces. A few months ago this coke would have been taken gladly. There has been considerable sale of this for heating purposes, lime burning, etc., but at only slight price concessions, generally $5@$5.25. On regular furnace coke there is little effort made to obtain more than $5.50. Spot foundry coke is not quotably changed, but there are more and better brands to be obtained at prices regarded a week ago as the general market. Some operators still have not revised their quotations to a practical basis.

Furnace coke reported a week ago as having been put under contract on a five to one ratio basis, amounted to between 40,000 and 45,000 tons a month. Additional business has been closed on this general basis, bringing the total up to about 75,000 tons. Some contract business closed some time ago

on terms more favorable to the coke operator has not been revised, but will have to be, as furnaces cannot operate on the contract basis prescribed. Of the latest contracts, a favorite form is that in general the invoice price of the coke in a month is to be one-fifth the market price of basic pig iron, f.o.b. valley furnaces, in that month, but that if pig iron goes below $28.75 coke shall not go below the $5.75-price, while on the other hand if pig iron should go above $35, which would call for a $7 coke price, 35c. shall be added to the $7 for each $1 that pig iron advances.

We quote spot furnace coke $5.25@$5.75 and foundry at $7@$7.50, per net ton at ovens.

UNIONTOWN

Coke Market at Standstill—Operations Being Suspended—Coal Goes Begging—Many Unconsigned Loads — Contract Suspensions Heavy.

The Christmas season finds demand for coal and coke at the lowest point reached at any time since the war. The price at this time last year was at about the present level although demand was more brisk.

The coke market is at a standstill, virtually no sales being made at any price. In lieu of any demand coke operators are doing the natural thing, either suspending operations entirely or restricting output to the point of contract requirements not yet suspended. It is estimated that there are nearly 400 cars of unconsigned coke in the region, due to a suspension of contract shipments and an equal number of unconsigned coal loads.

There is a feeble demand for coal if the operator or jobber is sufficiently aggressive to find the market. Steam coal is quoted $2.75@$3; gas $3.75@$4; lump $4.25, and slack $3. Any of these quotations are subject to change downward when there is a possibility of losing a sale.

The optimistic attitude of coke operators continues although the general situation is not only showing no improvement but the opposite prevails. They are simply playing a "waiting game" until the steel trade completes its readjustment, when they say that coke will again assume its old status of importance. It has been demonstrated that the region's output is barely sufficient to meet the normal needs of blast furnaces and they are therefore showing no concern.

FAIRMONT AND PANHANDLE

Car Supply Improves — Production Moved with Difficulty—Price Bottom Reached—Cancellations and Rejections Are Numerous.

Fairmont

An improvement in the B. & O. car supply marked the week ended Dec. 18. Mines on the Monongahela had a well sustained supply during the greater part of the week, although empties on branches of the Western Maryland were not quite so plentiful.

It was believed that the price bottom had been reached before the end of the week, when Pittsburgh coal, after declining to $2.75, remained steady at that figure. A limited amount was shipped to Tidewater at $3. Operators said that a further reduction could not be made without going below production cost. Western markets were extremely flat while Eastern centers continued to absorb the majority of the output. Poor market conditions have already caused the suspension of numerous operations.

Operators charge the Erie, the B. & M. and the Maine Central railroads with rejecting shipments unfairly and trying to secure a price concession on the coal which was purchased a short time ago at $3.50.

Northern Panhandle

Transportation conditions were practically unchanged, Pennsylvania mines securing a perfect car supply, while B. & O. operations were limited by a 50 per cent placement. Producers were greatly limited in their distribution by poor trade conditions, much of the product, as heretofore, going to Northern and Western centers.

Spot demand was extremely light, causing further price concessions. Mine run was quoted at $3, screened grades $3.25@$3.50. Majority of the output was going on contracts, but even this volume was being rapidly reduced by numerous suspensions and cancellations. Any further price recession is believed to be impossible, owing to production costs.

Middle Appalachian

LOW-VOLATILE FIELDS

Inadequate Car Supply Continues — Contract Movement Heavy — Prices Shade Off — Market Inactive and Cancellations Are Numerous.

New River and the Gulf

Production was entirely upset in the Gulf region as had been the case since late in November by a dearth of cars on both the Virginian and the Chesapeake & Ohio. On the former the placement of empties during the week ended Dec. 18 was not over 50 per cent of mine rating. On the C. & O. it was not over 40 per cent. Much disorganization prevailed on the Virginian as the result of internal troubles, the management and working forces being at sixes and sevens so that despite new equipment being received there was no improvement in the car supply.

Tonnage produced was not large enough to meet expectations of contract customers, for whatever may have been the case in other fields, there was no general effort on the part of buyers to cancel contracts or suspend shipments. Still, there was no general spot demand. The small volume of coal sold on the open market was quoted $5 @$5.25 a ton.

Car supply in the New River region was also unimproved. Mines were hardly able to work more than two days during the entire week. Conditions were so bad that between Dec. 1 and 18 some N. R. mines had not had more than four days full supply.

The market for the West was extremely flat. There was a somewhat better demand from Eastern points. What little spot coal was moving brought a price of $5. Market conditions in general failed to affect mining in the New River region because the output was not equal to the aggregate of contract orders.

Pocahontas and Tug River

Heavier inroads were made on production in the Pocahontas region during the week ended Dec. 18, because of the inability to secure cars. Mines were not able to produce more than 60 per cent of capacity as the car shortage alone cost a production of 40 per cent. Heavily stocked Western markets were responsible for the failure to return cars, though at the same time it was felt that in using cars for general transportation purposes, the number available for coal handling had been materially reduced.

With the supply so curtailed loadings were not sufficiently heavy to fill all regular orders. While there were many suspensions of orders, there was no cancellation of contracts. The market was extremely poor and because of the light demand mine run was not averaging more than $4.50@$5 with prepared sizes quoted, $5.50@$6.

Pronounced shortage of cars in the Tug River field greatly reduced the output. For a time the placement on the N. & W. held up fairly well, but mines were unable to work more than half the week in the aggregate. Little or no coal moved to Western markets except on contracts, and there were reported as being at the Lakes many cars unsold or rejected, such coal having been forwarded when prices were higher than is at present the case.

Extreme sluggishness featured spot market conditions. With the demand so light mine run sold off as compared with the preceding week, being quoted $4.50. Even prepared sizes were not more than $5.50@$6.

HIGH-VOLATILE FIELDS

Car Shortage Continues — Inclement Weather and Poor Motive Power Bar Production—No Spot Demand—Labor Is Entirely Adequate—Many Cancellations.

Kanawha

Production during the week ended Dec. 18 was the worst observed in some time. Car supply ranged from 38 to 45 per cent, being just as poor on the K. & M. as it was on the C. & O. Not enough coal was produced to fill contract re-

quirements notwithstanding the many cancellations that were being received, some resulting from a plain attempt to avoid paying prices higher than those prevailing on the open market.

Demand simply did not exist and prices were depressed to an even greater extent. Spot steam went for $3 a ton on the average. Tidewater coal was quoted $3.50@$3.75. Prepared sizes held firm at $5, colder weather bolstering the market a trifle.

Logan and Thacker

At the very outset of the period there was a dearth of cars in the Logan field and conditions grew steadily worse during the week. In addition to the shortage of cars, inclement weather and inadequate motor power reduced the weeks output to less than half of normal. Producers were falling behind on contract deliveries even though many buyers had cancelled their regular bookings and were apparently bent on further cancellations. Operators showed no interest in seeking new contracts, as it was believed the bottom had been reached and future quotations would show some gains.

Prices on the spot market continued to decline, mine run being quoted at $3, with slack $2.50. Prepared sizes were in better demand at $5, although the demand was becoming weaker. Tidewater quotations reflected the weakened market with a price range of $3.25@$3.50.

While strike leaders would not of course concede it, nevertheless there was no longer any strike loss apparent in the Williamson field during the week ended Dec. 18. Not more than 100 miners were in the tent colonies and only a few hundred of those who originally struck were still out of the mine. Production was almost normal, being in excess of 100,000 tons. Forces at the various mines were being enlarged from day to day; labor was plentiful and men were even being turned away.

Much coal was going forward on belated contracts. Only the smaller mines were prevented from operating because of "No Market." Little free coal was sought, at lowered quotations of $3 for steam and $2.50 for slack.

Northeastern Kentucky

A scarcity of cars was still seriously hampering operations in the week ended Dec. 18. Total losses were placed at 45 per cent, with a car shortage of 33 per cent. Production was not sufficient to even care for contract requirements and few sales were negotiated in the open market.

Mine run prices were practically unchanged, $3@$4 with prepared sizes considerably weaker, $4@$4.50. Nut and slack also declined slightly to $2.25. A general absence of demand was beginning to have its effect on the smaller mines, and those without contracts or sales affiliations were beginning to suspend operations. About 35 of these were in idleness during the week. Some operations closed down until after the holidays in view of the extremely sluggish market prevailing at the present time.

Virginia

Production was materially hampered in the week ended Dec. 18 by a shortage of cars, entailing a loss of about 40 per cent. Notwithstanding the general market condition the number of cars furnished was not large enough to enable mines to get out the tonnage they were under contract to deliver.

There has been little change in the operation of tipple mines as compared with the preceding week, most of such still having orders enough on hand to keep them going for several weeks to come.

While spot business was far less in volume than usual, some coal was being sold $3.50@$4, there being a fair spot demand both as to Inland and export markets. Cancellation of contracts was the exception rather than the rule during the past week.

Middle West

WESTERN KENTUCKY

Demand Slow for All Grades—Mines Running on Reduced Schedule—Cancellations Are Heavy.

Prices as a whole have been fairly well maintained. There has been a good deal of weakness since heavy cancellations left some operators with practically no orders on their books. Some operations are facing a shutdown, as the larger mines do not feel like selling under present conditions, and the smaller ones cannot produce cheaply enough to show much profit.

The spot market, established on actual offerings shows lump, $4; mine run, $2.50; screenings, $2. However, cancellations, over-production, etc., have made for more cheap spot coal than usual during the past few days. Buying should improve with the colder weather, or anything like a normal industrial demand.

Public utilities are buying lightly, there is not much railroad demand, nor anything of importance to take present production. Lump continues the best item, with mine run dull, and screenings very hard to sell.

DUQUOIN

Production Is Good—Movement Largely Confined to Contracts—Prices Touching Bottom.

Conditions during the week were practically unchanged, production being usually good, car supply excellent and demand very poor. Many mines are almost dependent upon their contracts. However, no additional "no bills" were reported. Some few mines have closed down indefinitely around Belleville and several in the Springfield district.

The demand seemed to have fallen off entirely in and around the Chicago district, but on the other hand the Northwestern states are taking a good tonnage. This trade is very unstable, however, and some of the mines are operating with very few orders for their coal. Prices have continued their downward trend and orders are difficult to secure.

INDIANA

Indiana Domestic in Better Supply—Steam Market Sluggish — Prices Reduced.

During the last week the domestic situation has been rapidly relieved and dealers are able to get all the fuel they want. This is particularly true in Indiana where the injunction granted by the U. S. District Court in favor of the Vandalia Coal Co. and the Vigo Products Co., and enjoining the State Food and Fuel Commission from interfering with their business, has resulted in the diversion of a tremendous amount of coal into the bins of Indiana retailers.

Figures compiled by the Indiana Coal Trade Bureau show that for the week ended Dec. 11, there were shipped intrastate for domestic use 1,737 cars of coal, as against 1,102 cars for the week ended Nov. 13.

Total shipments into Indiana for the week ended Dec. 11, exclusive of the Chicago switching district, were 6.390 cars, while for the week ended Nov. 13 the same district received 4,935 cars. The biggest increase, of course, was in domestic coal. Total shipments for the week ended were 12,474 cars.

The demand for steam has been much less urgent than it was a month ago, but lump is finding a ready market in some instances at much lower prices than recently prevailed.

West

UTAH

Cold Weather Livens Demand—Stocks Are Ample—Operating Conditions Are Satisfactory.

Utah is experiencing the first cold weather this winter, following a few inches of snow which fell some days ago. The demand for coal has increased accordingly, but retailers are well able to take care of the situation.

Ogden dealers claim their city is in especially good position in this respect. The Lion Coal Co. has 3,000 tons of coal which is sufficient, it is said, to supply the entire population for nearly seven weeks should there be a shortage and other firms prove unable to supply their customers.

With the present good operating conditions, producers are able to fill all demands made upon them and this district enters the new year with no possibility of any serious shortage.

MINE And COMPANY NEWS

ALABAMA

Blakely Island, the site selected for the **Mobile coal terminals** of the Government, has been purchased with funds provided by the business interests of that city, supplemented by subscriptions from coal operators in Alabama, and the deed conveying the property to the Government has been passed. It is understood that no unnecessary delay will occur in the commencement of work on these terminals, for which an appropriation of $400,000 is now available.

The report of the War Finance Corporation shows that a loan was made to the **Empire Coal Co.**, of Birmingham, in the sum of $277,174, of which $154,881 is outstanding.

ILLINOIS

A new corporation, to be known as the **Scranton Mining Co.** of Marion, has been formed for the purpose of purchasing the Scranton mine. Incorporation papers were granted to D. S. Gent, Robert Payne and W. L. Walton of Chicago for a company with a capital stock of $600,000.

The Marion County Coal Co. of Centralia has contracted with the Roberts and Schaefer Co. for the boiler coal and conveying equipment in connection with their tipple at Centralia.

INDIANA

A new source of coal supply has been found in Parke County, according to an announcement made recently, following the classification by the Department of Conservation of a few samples of coal found there. The coal is said to be excellent for domestic use.

The machine shop and wash house at the **Speedwell mine**, west of Terre Haute, were destroyed by fire recently. The loss is estimated at $15,000.

A new coal mine is soon to be opened on the Dunlap farm, near Newport, north of Clinton. The machinery for opening the new mine is now on the ground. Another big surface mine is being developed near Newport, and the **Northwestern Coal Co.** is said to have 550 acres of land leased for this undertaking.

KENTUCKY

The Bennett-Calloway Coal Co., Hulen, capital $15,000, has been incorporated by W. S. Bennett, G. S. Calloway and R. M. Calloway.

Suits were filed recently in circuit court at Louisville, Ky., by the **Manchester Coal Co.**, vs. **the Sun Coal Co.**, and **Allied Coal Co.**, Louisville, allied concerns, for sums alleged to be due for royalties, coal shipped, etc.

OHIO

The Caladonia Coal Co., New Lexington, of which James Williamson of Columbus is chief owner and active manager has opened a new mine near this place on the T. & O. C. R.R.

The Fairview Coal Co., headquarters Cleveland, who operate the Fairview mine at Crescent, has recently acquired 800 acres of coal land at Lafferty, Belmont County, in No. 8-A vein, where a new mine will be opened. The officers are U. C. Hatch, president; A. W. Dean, secretary-treasurer; and D. N. Snetsinger, purchasing agent.

The Fair Practice Committee of the Northeastern Ohio Coal Producers, which was organized late in October, has been discontinued, the purposes for which it was organized having been accomplished. The personnel of this Committee was: S. H. Robbins, chairman; C. E. Maurer, Whitney Warner, Thos. K. Maher, Michael Gallagher, and D. F. Hurd, secretary.

Announcement was made on Dec. 10 by officials of the **Marcol Coal Co.** that that company just organized by the Mahers and associates of Cleveland would undertake at an early date the development of 16,000 acres of coal land in the **Powhatan district** about four miles below Powhatan, the coal lands owned by this company being worth approximately $2,000,000. The Marcol Coal Co. was organized by J. A. Maher, of Cleveland, Ohio, president; J. C. Heinlein, of Bridgeport, Ohio, vice president and general counsel; J. V. Maher of Cleveland, treasurer; K. G. Perry, Cleveland, secretary; W. J. Maher, D. V. Maher and Thomas K. Maher, all of Cleveland. In connection with the plan to develop the 16,000 acre tract it is learned that the American Gas & Electric Co. which has a large power plant at Beech Bottom, W. Va. has been asked to install a large power plant.

According to information in circulation the **Hillman interests of Pittsburgh** have consummated a deal for the purchase of 500 acres of coal land near Waynesburg, in Franklin township, 400 acres being purchased from T. J. Wiscarvers, the other 100 acres being in the Buckhannon tract. It is understood that the price paid was $300 per acre.

OKLAHOMA

One of the biggest industrial sales recorded in Oklahoma took place recently when the coal mining properties of the **Creek Coal & Mining Co.** and the **Victoria Coal Co.** were acquired by the **Crowe Coal Co.** of Kansas City. The new owners have already taken over the new properties and are following the policies of the former owners in producing and selling coal. The Creek Coal & Mining Co., and the Victoria Coal Co., have long been one of the largest coal operators in Oklahoma and their coal production has done much to give Henryetta a foremost place in the coal producing region.

PENNSYLVANIA

The J. S. Wentz Coal Co. will finish its new breaker about February 1. According to officials, production will jump from 800 to 1,500 cars a day when the plant is put into operation. The increased tonnage will come from the Porter Swamp strippings near to Hazle Brook.

There has been a tremendous slump in the coal and coke business, especially the latter, in the past two weeks. **The Hillman Coal & Coke Co.** has shut down all its ovens except one plant and is shipping coal. **The American Coke Corporation** has done likewise at the Sunshine plant near Brownsville and is curtailing operations at the Orient plant. **The Lincoln Coal & Coke Co.** and the **Snowden Coke Co.** have closed down entirely. The **W. A. Stone** interests of Uniontown are doing the same. **The Pittsburgh Steel Co.** are operating their coal and coke plants at less than 50 per cent of normal. **The Republic Iron & Steel Co.** and the **Century Coke Co.** are also curtailing operations.

The Grazier Coal Co. of Johnstown declared a dividend of 8 per cent, payable on Dec. 15. A. W. Hildebrand of New York is president and H. F. Grazier of Johnstown, secretary-treasurer.

The Harco Coal Co. with offices in Johnstown, declared the regular quarterly dividend of 1¾ per cent on preferred stock and an initial dividend on the common stock of the company of $1,000 per share, payable Jan. 1. H. J. Meehan is president and John C. Cosgrove is secretary-treasurer.

Deals were closed this week whereby the **Cambria Steel Co.** takes over valuable unmined coal lands in Cambria County. The deals include three tracts purchased from the Morrellville Coal and Coke Co., wherein the consideration was $86,000; fifty acres from F. H. Seely of Altoona and more than 600 acres from the Piney Run Mining Co. The consideration in the Seely transfer was $9,120. This coal can all be reached by the Cambria Steel Co. by cutting through from the Rolling Mill Mine.

UTAH

When Governor Bamberger of Utah who is about to retire was elected four years ago he promised that if the state legislature would appropriate $25,000 for the purpose of a special audit it should bring the state exchequer handsome returns. The legislature made the appropriation and the audit was commenced but it was not till a day or two ago that the source from which "the handsome returns" were to come was known. The report of the auditors in question deals principally with the sale of coal lands by the state to dummy entrymen, who are declared to have secured the lands ostensibly for grazing purposes and thereby obtained valuable property for practically nothing, the land afterwards being used for coal land. It is expected that immediate steps to recover for the state all lands obtained in this way which are found to contain valuable coal deposits will be taken.

WASHINGTON

The first coal from the new mine of the **Tilton River Bituminous Coal Co.**, at Lindberg, in eastern Lewis County, was shipped the middle of December, according to George A. Brooks, manager of the company. The company expects to turn out 500 to 1,000 tons daily.

WEST VIRGINIA

Operations of the **Wilsondale Coal Co.** will be at Wilsondale in the Wayne County field, this corporation having just been organized with a capital stock of $10,000. Engaged in promoting the company were: A. W. Wilson, of Saltsburg, Pa.; William Elswick of Wilsondale, W. Va.; J. H. Meek, and Nellie Sands of Huntington, W. Va.; and Anna Bush of Ceredo, W. Va.

Ohio people have organized the **Glennova Coal Co.**, Wheeling, for the purpose of operating in Richland district of Ohio County, the company having a capital stock of $50,000. Conspicuous in the organization of this company were: C. H. Eberts, E. J. Eberts, G. S. Eberts, H. W. Eberts of Warwood, W. Va., and T. H. Johnson of Bellaire, Ohio.

Having secured a lease on 361 acres of coal land four miles from Elkhorn City, Ky., (postoffice Praese, Ky.,) the **Dominion Smokeless Coal Co.**, Huntington, which was formed a short time ago, is now installing its plant and expects to begin shipping coal in 60 days. The general offices of the company at Huntington will be in charge of Charles H. Bronson, secretary-treasurer of the company.

Having perfected its organization by the election of officers, the **Two-Seam Coal Co.**, Winding Gulf, formed a short time ago, has initiated work on its new plant on the Kanawha & Michigan R.R., near Boomer. The new officers are: H. B. Turner, president, Winding Gulf, W. Va.; Dr. A. N. Tieche, vice-president, Winding Gulf, W. Va.; S. W. Shumate, secretary-treasurer, Winding Gulf, W. Va.; I. B. Perkins, manager, Boomer, W. Va.

The Robinson Coal & Coke Co., Sutton, recently organized, has elected the following officers: I. H. Humbert, president; W. J. Robinson, vice president; J. M. Thomas, secretary-treasurer; W. J. Robinson, general manager. This company has 180 acres available for development in Holly district of Braxton County. The company's mine will be at Holly Junction with postoffice at Palmer.

ALASKA

In Alaska a part of the **Cook Inlet coal field** has been surveyed and divided into nineteen leasing blocks containing 9,500 acres which was offered for lease, one lease being granted. A block of 565 acres was surveyed in the Nenana field and a lease awarded. The Department is still considering applications to lease 2,040 acres in the Bering River field and 1,080 acres in the Matanuska field. Coal lands under lease cover 4,500 acres in the Bering River field; 2,840 in the Matanuska region; 1,400 in the Cook Inlet field and 563 in the Nenana district. Coal land entries covering 6,256 acres were approved for patent. A total of 2,797 acres of coal land were withdrawn for classification, while 1,293,307 acres previously withdrawn had been restored.

The **Howard Collieries Co.** mine at Chattoroy, was fired upon by unidentified persons, according to information received from the superintendent of the mine. No casualties were reported. The fire was returned by Federal soldiers on duty there.

Traffic News

The Ohio Utilities Commission has issued an order suspending the advanced freight rates asked by Ohio railroads on intrastate traffic. The suspension is made until Jan. 18. In the meantime, hearings on the question will be had. A loss of approximately five million dollars to Ohio railroads annually will result if the new schedule of rates is not allowed.

Suit to quiet the government's title to a large parcel of **Routt County coal land,** involving a $100,000 bond issue underwritten by the Central Savings Bank, has been instituted in the United States District court in Denver, in which the bank is made co-defendant with the **Rugby Fuel Co.** The government alleges that while equity proceedings were pending the Rugby Fuel co. obtained from the **Routt County Coal Co.,** a warranty deed to the land.

As the railroads have cancelled the schedules, the Interstate Commerce Commission has set aside its recent order suspending until March 1 regulations covering **dumping, skidding, trimming and leveling coal and coke at Virginia ports.**

The Chicago, Rock Island and Pacific R.R. recently made a claim for loss or shortage in delivery of coal which has been passed on by the comptroller of the treasury. The railroad said that where carriers comply with the Oklahoma law in sealing cars they are not obliged to accept wagon weights, and that the cars in question were sealed at Lawton, Okla. It appears that one car was not sealed. In two cars the weights determined by the consignor were correct. No evidence having been furnished that the weights shown on the bills of lading were incorrect, the previous decision, declining allowance, is affirmed.

W. L. Mapother, of the Louisville & Nashville R.R., stated at a recent meeting of the Transportation Club of Louisville that the road had arranged to spend $33,000,000, on improvements, including cars, engines, road improvements, etc., a considerable portion of which would be in the coal regions, or for handling coal.

In the case of the **Gallatin Lumber Co.** an examiner recommends that the rates on coal from Kirby, Wyo. to Greenwood, Mont. and Bozeman Hot Springs, Mont., are not unreasonable, and that the complaint be dismissed.

A tentative report of an examiner of the Interstate Commerce Commission recommends that the rate on bituminous coal from southern Illinois mines to Tallulah, La., be declared to be reasonable, and that the complaint of the **Tallulah Cotton Oil Co.** be dismissed.

In the complaint of the **Potlach Lumber Co.** an examiner recommends that the commission decide that the rate on coal from points in Washington to points in Idaho are not unreasonable.

The Dewey Fuel Co. recently filed with the I. C. C. a complaint requesting reparation from the Chicago Northern R.R. in connection with coal shipments from Kona and other points in Kentucky to Jackson, Mich. An examiner has recommended that the commission dismiss the complaint, as the rate is not unreasonable, and the damage to the fuel company resulting from the adjustment complained of was not established.

The Supreme Court has dismissed the case of **Truman A. Ketchum vs. the Pleasant Valley Coal Co.** for want of jurisdiction, the lower court having decided in favor of the coal company. The case was an equity suit involving title to a quarter section of coal land in Carbon County, Utah, known as the Marks entry, the land having originally been entered by Stephen R. Marks, and passed through several hands and eventually into the hands of the defendant company.

Action by the Interior Department in Coal matters on public lands is reviewed by the Commissioner of the Land Office in his annual report, who says that in Utah a compromise was reached in a suit against the Denver and Rio Grande Fuel Co. by payment to the government of $44,244. An indictment for coal trespassing was obtained in North Dakota.

Association Activities

Team Track Operators Association of West Virginia

The fact that prices are at low ebb, that it is almost impossible for team track operators to continue work at their mines, did not stand in the way of a large attendance at a meeting of the association, held in Clarksburg recently, for the purpose of considering future plans.

Confident of the future, the association fomulated plans not only to continue activities and maintain its organization but also to make still greater effort to secure open top cars to which the association feels it is entitled inasmuch as open tops are being used for transporting all classes of commodities. To deny the wagon-mine operators open tops under present conditions is a species of discrimination.

J. T. Michael is retained as executive secretary. He was also chosen as treasurer of the association to fill the place made vacant by the resignation of T. L. Ferguson of Shinnston.

Impetus was given at the meeting to the movement for the organization of a state association of team-track operators, it being reported that team-track mine owners over the state were taking kindly to the proposal to form a state organization even though wagon-mine operations are largely at a standstill.

Winding Gulf Operators Association of West Virginia

It was brought out during the annual meeting of the Association held at the Bellevue Stratford Hotel in Philadelphia, that since the organization of the association the pay of men employed in the mines of the Winding Gulf District had been increased as follows: Miners, 24 per cent; Day men, 173 per cent; Yardage and dead work, 40 per cent. That fact was developed in the annual report of E. E. White, the president of the association, who was elected President of the association for another year. Members of the new executive committee are: E. E. White, of Glen White; C. H. Mead, of Beckley, W. Va.; W. Gaston Caperton, of Slab Fork, W. Va.; J. C. Sullivan, of Tralee, W. Va.; P. M. Synder, of Mount Hope, W. Va.; W. B. Beale, of Fireco, W. Va. and George R. Collins, of Charleston, W. Va.

In order to secure a closer co-operation between the operators of the Winding Gulf region and to secure better facilities, the association formed a special standing committee of four members to be known as the Committee on Railroad Relations, the members named for such committee being George Wolfe, secretary of the association, W. P. Tams, C. H. Mead and John Laing. It will be the province and duty of that committee to secure general improvement in transportation facilities, and an enlargement of railroad facilities to care for additional development and the consequent increase in tonnage to be moved.

The president in his report reviewed the accomplishments of the association during the year, speaking of the growth of the association, of wage increases, of information furnished members, of the effort to secure larger loading of freight cars, of the efforts to advertise the region through post cards, of the prosecution of law breakers, of the establishment of the Sewell's Point exchange, of the labor situation in general, at the same time outlining questions for future consideration.

Smokeless Coal Operators Association Of West Virginia

Election of a Board of Governors and of new officers for 1921 were the most important features of the annual meeting of the association held in Philadelphia recently. The association sanctioned a change in its by-laws increasing the number of vice presidents from two to three. After that had been done the members voted upon the question of membership on the Board of Governors, the result of such election being as follows:

New River field—C. C. Beury of Charleston and Robert E. Grose, of Boston. Winding Gulf District—A. J. King of Huntington and John Laing of Charleston. Tug River District — George Wolfe of Beckley and John T. Wilson of Bluefield. Pocahontas District—Col. T. E. Houston of Cincinnati and O. M. Deyerle of Bluefield.

The Board of Governors, in turn, elected the following officers for 1921: G. H. Caperton, of Charleston, W. Va., president; E. E. White, of Glen White, W. Va., first vice president; O. M. Deyerle of Bluefield, second vice president; E. J. McVann of Washington, D. C., third vice president; E. J. McVann, secretary; George R. Collins of Charleston, W. Va., treasurer.

Panhandle Coal Mining Institute

Under the direction of M. B. Coulter, inspector for the District of West Virginia this institute was organized in the circuit court room at Wheeling by officials and others connected with the mines of the Northern Panhandle, a number of mine owners as well as officials attending the organization meeting. Representatives of the various companies pledged their wholehearted support believing that many benefits were to be derived from the new organization. An address of welcome was delivered by Thomas F. Thoner, Mayor of Wheeling. One of the principal addresses was delivered by R. M. Lambie, chief of the Department of Mines.

Morgantown Consolidated Coal Operators Association

The association is still endeavoring to get the B. & O. R.R. to serve its members with open-top cars and in connection with that effort and the failure of the B. & O. to furnish open tops, George A. Viewig, president of the Association makes the following comment:

"The B. & O. has resorted to the very clever practice of forcing the smaller operators to go to the heavy expense of loading box cars at a time when profits are near the vanishing point and when the small margin of profit makes it impossible for the small operator to load box cars at a price which will compete with open-tops and still allow a sufficient margin to cover the additional cost of unloading these cars.

"If the B. & O. is willing to play the game as does the Pennsylvania system it would supply open-top cars to all mines regardless of class or size in compliance with Order 17 of the Interstate Commerce Commission which rules to allow any operator the use of open-top cars who can load same within twenty-four hours after placement.

"Putting team and truck operators out of business means a loss of one-half million dollars a year in pay rolls to this community, an amount worthy of serious consideration."

Coming Meetings

The Northeast Kentucky Branch of the **Kentucky Coal Mining Institute** will hold a meeting, Jan. 7, 1921, at Pikeville, Ky.

National Retail Coal Merchants' Association. Fifth conference of executives at La Salle Hotel, Chicago, Ill., will be held on Jan. 17 and 18, 1921. Secretary-Manager, Ellery B. Gordon, Philadelphia, Pa.

American Institute of Mining and Metallurgical Engineers' annual meeting will be held in New York, Feb. 14 to 17, 1921. Secretary, Bradley Stoughton, 29 West 39th St., New York City.

The Wholesale Coal Trade Association of New York, Inc., will hold its annual meeting in New York City, Jan. 18, 1921. Secretary, Charles S. Allen, 90 West Street, New York City.

American Society of Civil Engineers will hold its annual meeting Jan. 19 and 20, 1921, at its headquarters, 33 West 39th St., New York City. Acting secretary, Herbert S. Crocker, 33 West 39th St., New York City.

Northwest Mining Congress will hold its annual convention Feb. 28 to March 5, 1921.

Northern West Virginia Coal Operators' Association will hold its annual meeting Feb. 8, 1921. Secretary, H. S. Rogers, Fairmont, W. Va.

Pittsburgh Vein Operators' Association of Ohio will hold its annual meeting, Feb. 14, 1921, at Cleveland, Ohio. Secretary D. F. Hurd, 415 Marion Building, Cleveland, Ohio.

American Institute of Electrical Engineers and American Institute of Mining Engineers will hold a combined meeting of the local sections on Jan. 21, 1921, at Pittsburgh, Pa.

Canadian Institute of Mining and Metallurgy will hold its annual meeting March 2, 3 and 4, 1921, at Ottawa, Ontario (Canada). Acting secretary, R. R. Rose, Montreal, Quebec, Canada.

Largest Circulation of Any Coal Mining Journal in the World

Volume 18 — New York, December 30, 1920 — *Number* 27

COAL AGE

The Weekly Journal of the Coal and Coke Industries

R. DAWSON HALL *and* C. E. LESHER, *Editors*

Contents

ARTICLES

How Mather Colliery Stores Coal at the Mine in Times of Railroad-Car Shortage 1317

BY DONALD J. BAKER.

WHEN CARS WERE NOT AVAILABLE some means of keeping the mine running became imperative—a storage bin, a conveyor system and a locomotive crane solved the problem and the mine now operates, cars or no cars.

Nothing Lacking in Loading Machines but Co-operation of Mine Executives 1321

BY M. D. LEVIN.

New Features in Cutters Make Them Adaptable and Easy to Load and Unload 1323

BY S. B. KING.

AUTOMATIC FRICTION-ACTUATED, cable-carrying trailer and tilting swiveling guides that facilitate unloading and reloading are the chief of many improvements to the standard machine—low-vein model is a combination shortwall and longwall undercutter possessing the advantages of both types.

Fitting the Fan to the Needs of the Mine 1326

BY THOMAS CHESTER.

DISK FAN is suited only to low water gage—it delivers most air with 100-per cent ratio of opening and uses most power with zero opening—centrifugal fans use most power with 100-per cent opening and least with air blanked off.

Coal Mining Institute of America Studies Present-Day Mining Problems—II 1329

BY R. DAWSON HALL.

IS THE THICK FREEPORT the Upper Freeport and a rider or the Upper and Lower Freeport with interval missing?—Institute visits Jones & Laughlin byproduct plant, which uses unmixed Pittsburgh-district coal.

Relation of the Government to Basic Industries as Applied to New England's Coal Supply 1331

BY DR. H. A. GARFIELD.

IT WAS ONCE CUSTOMARY to order coal like groceries, depending implicitly upon the middleman—now it is necessary to co-operate with the source of supply, helping those who produce and distribute it—benefits of government data cited.

NEWS

Anthracite Operators Refuse to Grant Concessions Demanded by United Mine Workers 1338

OPERATORS DECLARE that while wages are falling and work is irregular the anthracite mine workers have high wages and steady work and should feel abundantly well satisfied with their contract.

Calder Committee Raid Fails to Yield Evidence of Wrongdoing by National Coal Association 1339

STRAIGHTFORWARD EVIDENCE of J. D. A. Morrow establishes propriety of association's activities—investigators not satisfied with explanations of high prices—Calder still seeks graft to justify nationalization scheme.

Smokeless Association Appoints McVann Executive Vice-President 1344

Tidewater Coal Exchange's Existence in Peril, Complaint Committee Says 1344

Upper Potomac and Georges Creek Sign Up 1344

Shipping Board Rejects All Coal Bids 1347

Bituminous Coal Produced in Eleven Months in Central Pennsylvania 1347

New Tidewater Exchange Pool Separates Pittsburgh and Sewickley Coal 1347

Anthracite Shipments Receded in November Because of Holidays 1347

Average Daily Coal Receipts at Italian Ports in Vessels Controlled by Italian Government 1347

MARKETS AND PRICES

Production and the Market 1348

WEEKLY REVIEW.

Reports from Market Centers 1350

News from the Coal Fields 1354

DEPARTMENTS

Editorials 1315

Problems of Operating Men 1334

Inquiries of General Interest 1336

Examination Questions 1337

The Weather Vane of Industry 1345

Foreign Markets and Export News 1346

Mine and Company News 1358

ADVANCE NOTICE—SEE PAGE 39—BUYING SECTION

Advertising Indexes—Alphabetical, 68; Classified, 63; Consulting Engineers, 28; Searchlight Section, 31-38

McGRAW-HILL COMPANY, INC., Tenth Ave. at 36th St., NEW YORK

JAMES H. McGRAW, President
ARTHUR J. BALDWIN, Vice-President
J. MALCOLM MUIR, Vice-President
F. M. FEIKER, Vice-President
EDWARD CALDWELL, Treasurer
JAMES H. McGRAW, JR., Secretary

WASHINGTON, D. C., Colorado Building
CHICAGO, 1570 Old Colony Building
PHILADELPHIA, Real Estate Trust Building
CLEVELAND, Leader-News Building
SALT LAKE CITY, 519 Newhouse Building
SAN FRANCISCO, Rialto Building
LONDON, E. C., 6 Bouverie St.
BUENOS AIRES, Calle Corrientes, 685

Publishers also of
Electrical World
Electrical Merchandising
American Machinist
Power
Engineering News-Record
Engineering and Mining Journal
Journal of Electricity
Chemical and Metallurgical Engineering
Electric Railway Journal
Ingeniería Internacional

Cable Address: "Machinist, N. Y."

The annual subscription rate is $3. Extra zone postage west of the Mississippi, and in Alaska, Hawaii, the Philippines, Porto Rico, Canal Zone, Cuba and Mexico, 50 cents. Extra postage in Canada, $1. Extra Foreign postage, $3 (total, $6, or 25 shillings). Single copies, 20 cents.

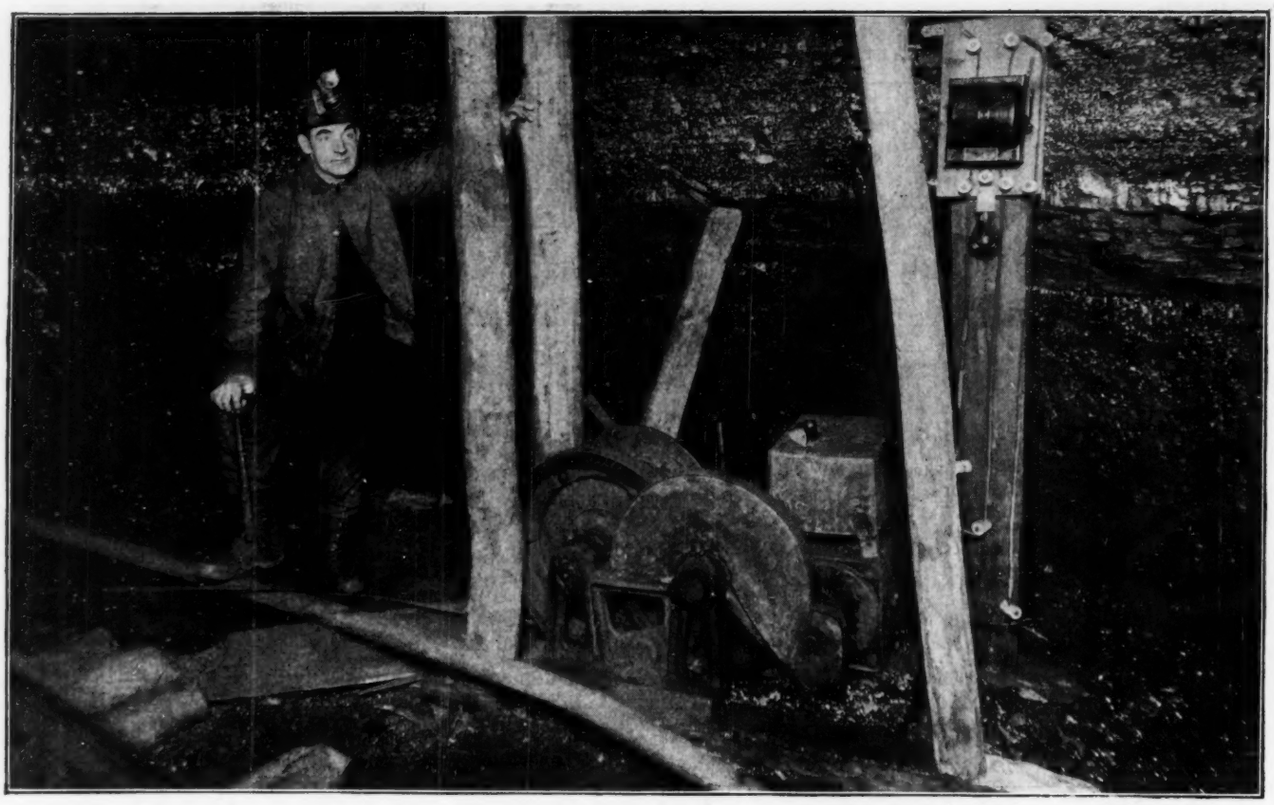
Change of Address—When change of address is ordered the new and the old address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1920, McGraw-Hill Company, Inc.

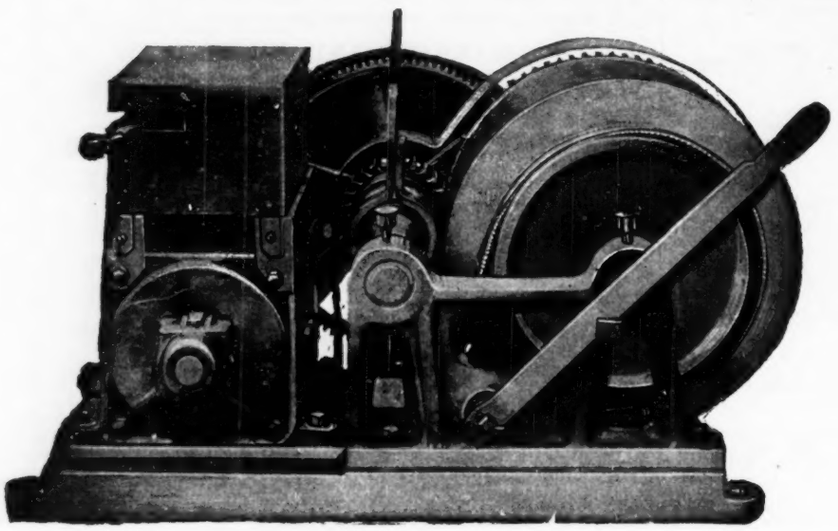
Entered as Second-Class Matter Oct. 14, 1911, at the Post Office at New York, under the Act of March 3, 1879.

Member Audit Bureau of Circulations. Member Associated Business Papers, Inc.

CIRCULATION OF THIS ISSUE, 13,900 COPIES



"Flood City" Room Hoist—



The following are "Flood City" features.

1. The main Gear is machine cut and securely bolted to the drum. In case it should become broken or stripped you replace only the gear; not a combined drum and gear.
2. The bushings are made of high-grade bronze, and are interchangeable. You keep only one type in stock instead of several.
3. The clutch which is used instead of the usual sliding pinion is of the three-jaw variety; and can be engaged safely with the motor running at high speed.
4. Motor and controller are especially suitable for mining service and practically "fool-proof."
5. The standard drum will hold 300 ft. of ½ in. wire rope. At a speed of 140 ft. per minute a rope pull of 1200 lbs. can be maintained; which will handle 4 tons on a 15% grade.

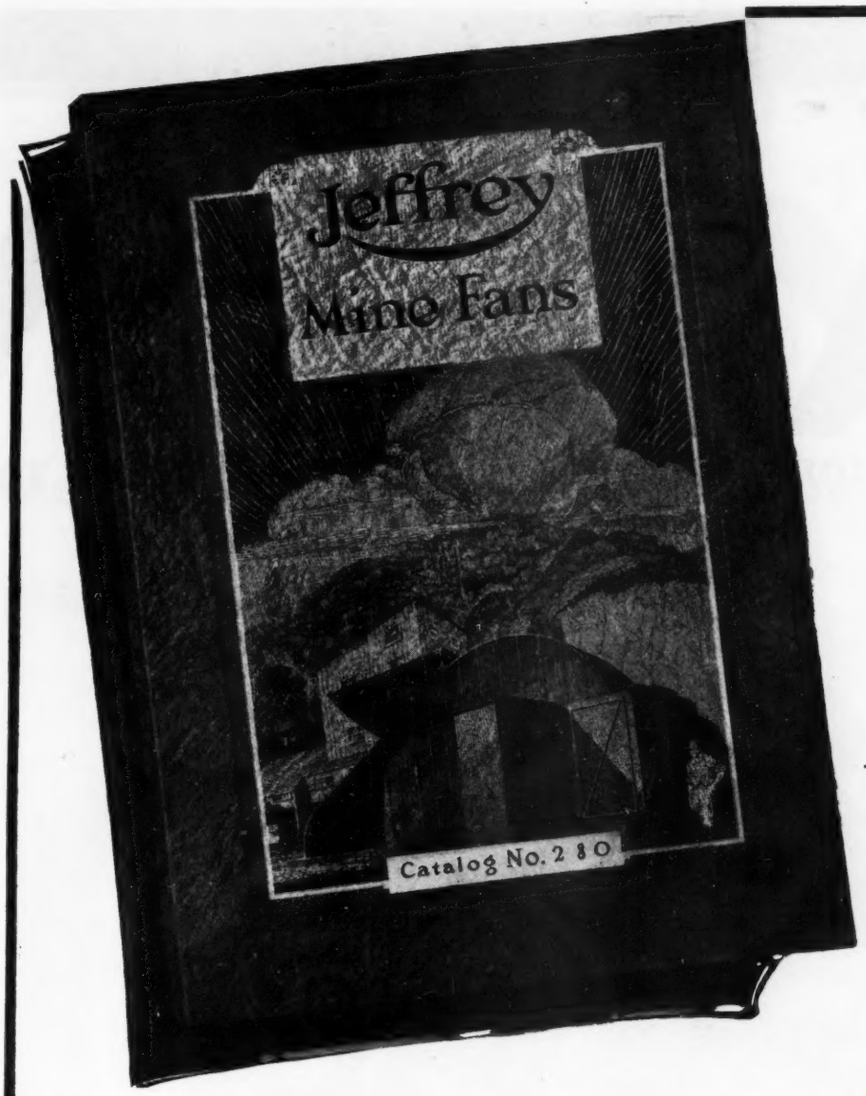
A sturdy, compact, electrically operated piece of equipment — with built-in qualities which fit it pre-eminently for the work it will have to perform in rough mine service.

The illustration shows the ease with which "Flood City" Room Hoists adapt themselves to conditions—they can do a good job anywhere.

Write for special Room Hoist Bulletin No. 51.

Flood City Manufacturing Company

Johnstown, Penna.



A Text Book On Mine Ventilation

OUR latest 80-page Catalog No. 280 on Mine Ventilation contains Data, Information, and Illustrations of actual installations, etc., which will enable you to solve any Mine Fan problem.

IF, however, you desire the services of our expert Engineers, they will gladly assist you in the selection of the proper size and arrangement of "Jeffrey Fan" Stepped Multi-Bladed for your requirements.

Your interests can be best served by a concern whose fans are designed for one purpose only, The Ventilation of Mines.

Write today for your copy of our new catalog—giving many reasons why Jeffrey Fans are selected by leading coal operators.

THE JEFFREY MFG. CO., Columbus, O.

New York
Boston

Philadelphia
Pittsburgh
Detroit

Scranton
Charleston, W. Va.

Chicago
St. Louis
Cleveland

Birmingham
Dallas

Milwaukee
Denver
Buffalo

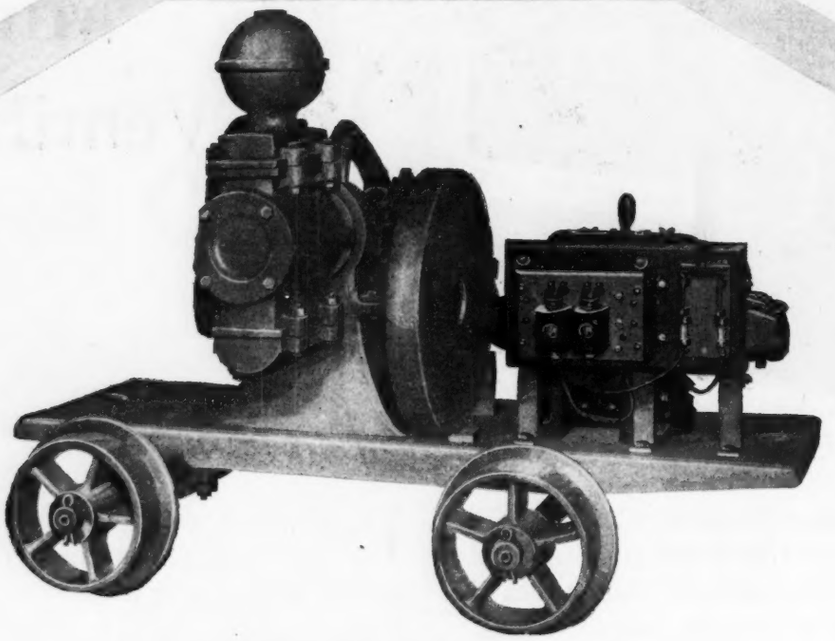
Montreal
Los Angeles

Leaders in the Manufacture of Coal Mining and Tipple Machinery

TRADE MARK

FAIRM

THE STRONGEST ORGANIZATION IN AMERICA DEVOTED TO T



YOUR BEST INSURANCE

against shutdowns during the wet season.

No. 1 FAIRMONT Gathering Pumps

equipped with "E. C. & M." Automatic Starters, cuts motor repairs at least fifty per cent and is easier on the pump.

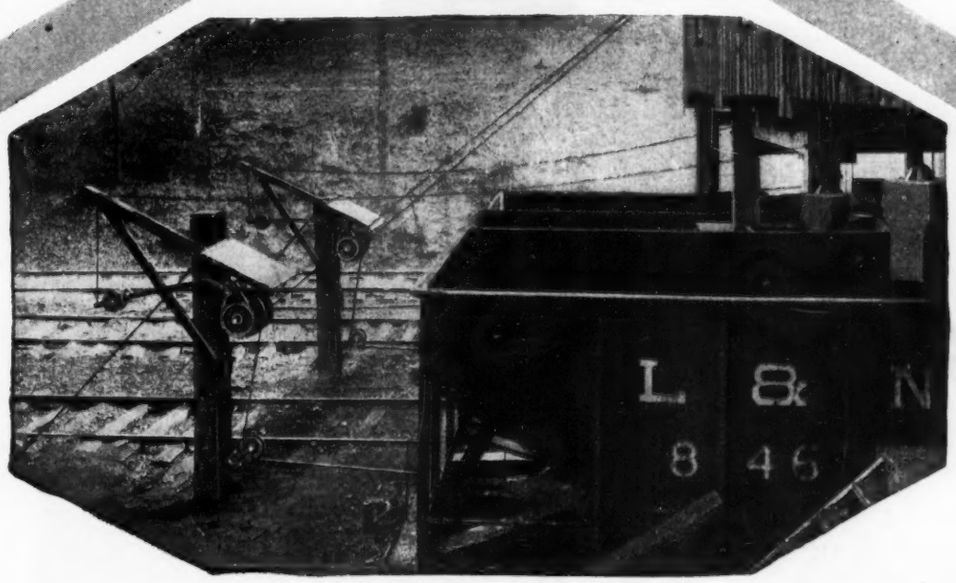
Pumps and parts in stock ready for immediate shipment.

Steel Mine Ties—Railroad Car Retarders—Portable Gathering Pumps—

REGISTERED

MONT

THE MANUFACTURE OF COAL MINE EQUIPMENT EXCLUSIVELY



TRADE MARK REGISTERED
FAIRMONT

CAR RETARDERS

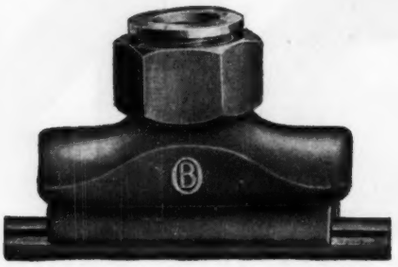
insure better trimming of your railroad cars at a marked reduction in breakage. Cars can be lowered an inch, or a foot, or a yard as necessary, with one simple movement of the operator's hand, no matter what the climatic conditions may be. You cannot overlook this feature when the tracks are icy and the brakes are frozen to the wheels.

Write us now—save time, trouble and delay later.

FAIRMONT MINING MACHINERY COMPANY
FAIRMONT, W. VA.

Turtle Back Strainers—Mine Cars—Mine Car Trucks—Box Car Loaders

Two Good O·B TROLLEY *Clamps*



BULL-DOG

THE MANSFIELD

O-B Clamps Stick to the Job

Put an O-B Clamp on the trolley and it is there to stay until it is deliberately removed and assigned to duty elsewhere.

O-B Clamps have a generous margin of strength which resists ordinary and extraordinary stress of service.

They are weatherproofed by O-B Sherardizing.

Two popular types are illustrated above.
There are others in the general catalog.

The Ohio Brass Company, Mansfield, Ohio

New York Philadelphia Pittsburgh Chicago Charleston, W. Va.
Los Angeles San Francisco Paris, France

VULCAN OF WILKES BARRE HOISTS
for Special Conditions

Local conditions often make a special type of hoist necessary to insure economical operation.

Here was the problem:

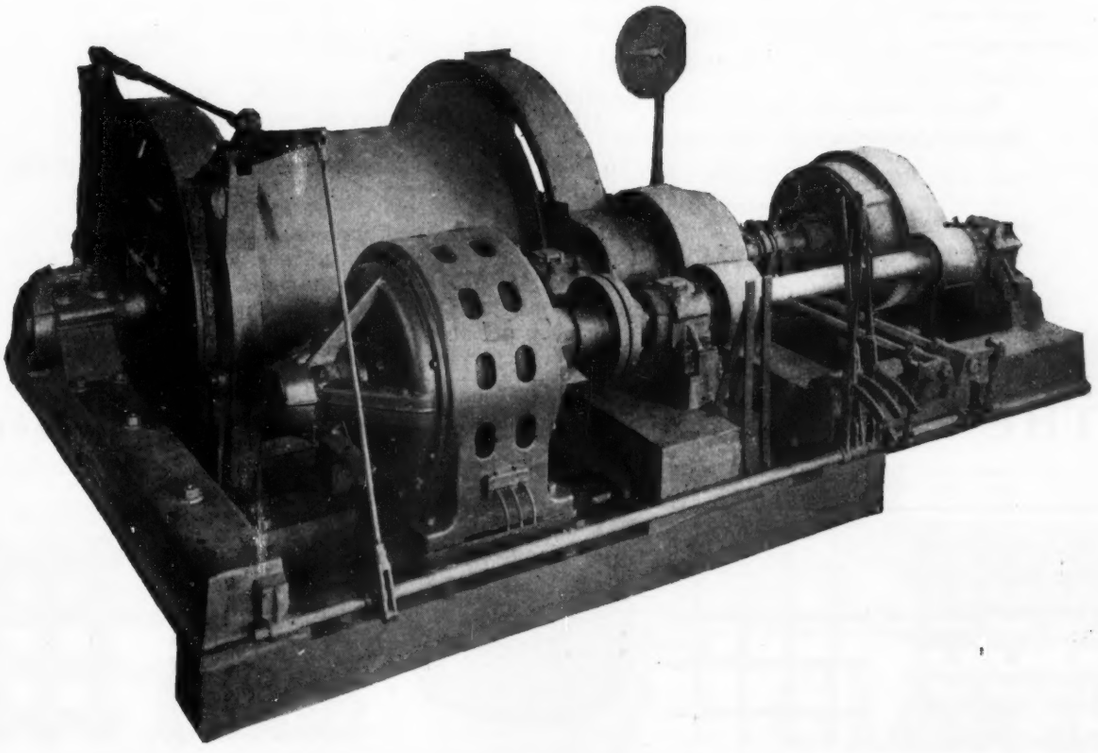
Rope Pull.....25,000 lbs.
Length of slope.....2,000 ft.
Rope speed desired.....750 F. p. m. on low gear
440 F. p. m. on high gear

and to solve it we built this two-speed friction drive hoist, operated by a 300 H.P. Induction Motor. The two-speed arrangement consists of two sets of Herringbone Steel Gears, the large gears of which are bored and bronze bushed to run loose on their shafts and are driven by heavy duty friction clutches, arrangement being such that change in speed may be made while hoist is in motion. Parallel motion post type brake is provided with adjustment to take up wear of shoes.

Built for M. A. Hanna & Co., Agents for Susquehanna Collieries Co., for mine at Glen Lyon, Pa.

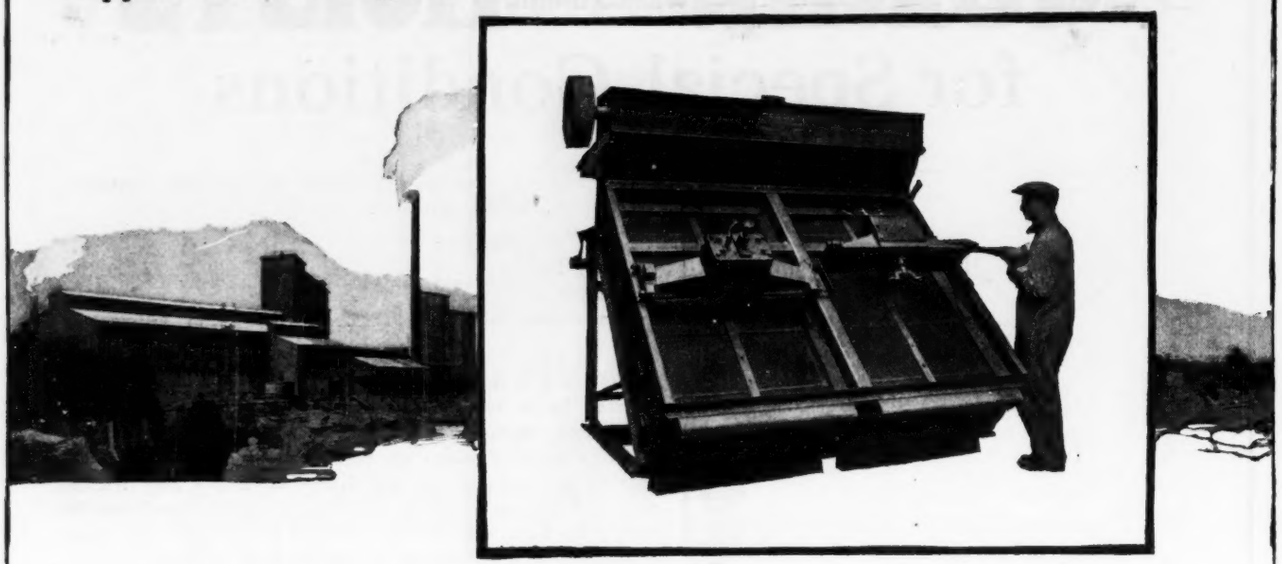
Submit your particular problem to our Engineering Department which brings to you the experience of more than seventy years in the design and construction of mine hoists.

VULCAN IRON WORKS
Established 1849
1730 Main Street, Wilkes-Barre, Pa.



HUM-MER INCLINED SCREEN

Applies Electro-Magnetic Vibration to a "Drumhead" Tension Screen



A FEW PROMINENT USERS OF *HUM-MER* SCREENS

Bethlehem Steel Co.
Pittsburgh Plate Glass Co.
Arizona Copper Co., Ltd.
Ottawa Silica Co.
Morris Fertilizer Co.
Goodyear Tire & Rubber Co.
American Smelting & Refining Co.
Continental Portland Cement Co.
Laclede-Christy Co.
The Norton Co.
Diamond Alkali Co.

"Makes wire cloth screen faster and wear longer"

Write for catalogue No. 42L

TONNAGE OUTPUT INCREASED

ONE company has installed 17 HUM-MER Inclined Screens. The following data gives the comparative results obtained with the HUM-MERS. In this installation, the desired material is an intermediate product, both the coarse and fines being taken out so that the percent of product in the feed is low.

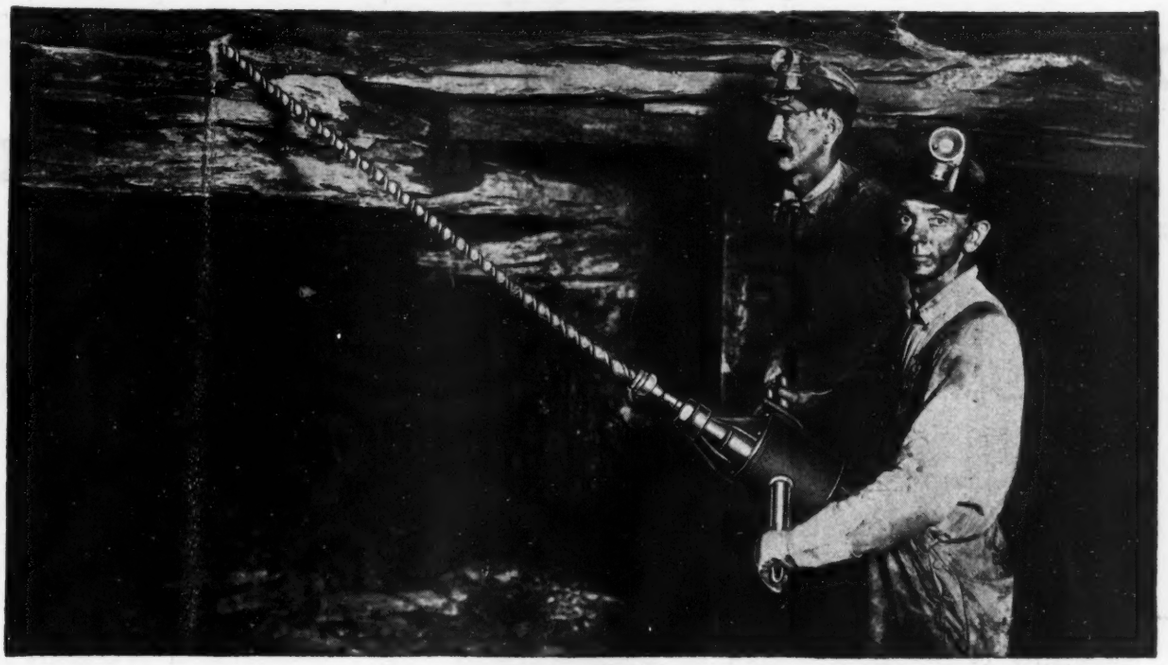
	Screen analysis of product	Tonnage per hour
Old Screen,	95.6% on 40 mesh,	1695 pounds
HUM-MER,	96% on 40 mesh,	4644 pounds

In this particular case a remarkable tonnage of 274% was obtained.

HUM-MER Inclined Screens have been supplied for screening a great variety of materials; both coarse and fine, in fact, the HUM-MERS in the field today have shown definitely that the HUM-MER will handle finer sizing than has ever been possible through a wire cloth screening surface, and this with profitable tonnage.

THE W. S. TYLER COMPANY, *Cleveland, Ohio.*

Manufacturers of Woven Wire Screens and Screening Equipment



How do you drill your shot-holes?

NOT by hand, surely, for Little Giant Portable Electric Coal Drills are from *five* to *fifteen* times faster!

A hole a minute, two inches in diameter, six to seven feet deep, is an average by a Kentucky company under a prolonged test of Little Giants—five times as fast as hand boring at one-fifth the cost.

Quite a difference in time, labor and money saved over old-time tedious, back-breaking, expensive hand methods!

Little Giants pay for themselves within a few weeks—a short time compared to the ten-year service record of several Little Giants in one prominent mine (an index to their low upkeep).

Little Giants are made in both pneumatic and electric types—a type and size fitting *your* needs. Outline your problems to the nearest Company Branch.

Have you read Circular No. 482?

Illustration shows a No. 473 Little Giant Electric Drill drilling 2-inch holes, six to seven feet deep, in an average time of one minute each, installed by a Kentucky company after rigid tests.

Chicago Pneumatic Tool Company

Chicago Pneumatic Building · 6 East 44th Street · New York

Sales and Service Branches all over the World

•Birmingham •Boston •Buffalo •Chicago •Cincinnati •Cleveland •Detroit El Paso Erie Franklin Houston Joplin •Los Angeles •Minneapolis •New Orleans •New York •Philadelphia •Pittsburgh •Portland Richmond Salt Lake City •San Francisco •Seattle •St. Louis Barcelona •Berlin Bombay Brussels Buenos Aires Cadiz Christiania •Fraserburgh Havana Honolulu Johannesburg Lisbon •London Madrid Milan •Montreal Osaka Paris Seoul Tokyo Toronto Vancouver Winnipeg

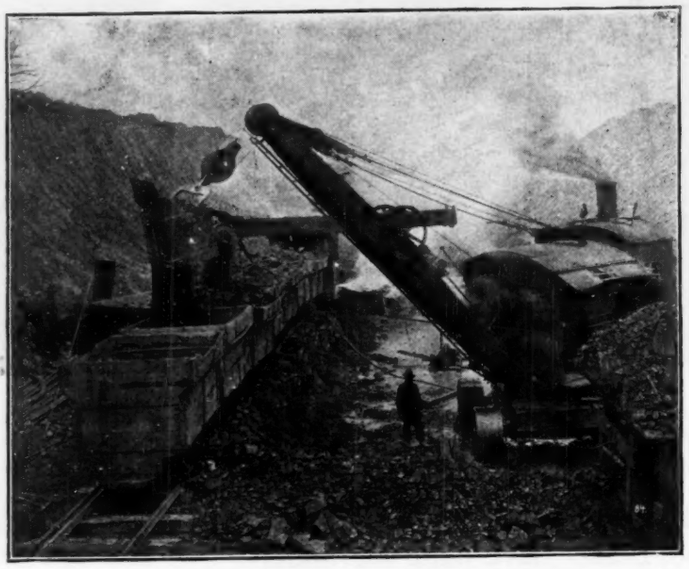
BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS,
GIANT OIL AND GAS ENGINES — ROCK DRILLS · · COAL DRILLS

CHICAGO CP PNEUMATIC

LITTLE GIANT

Coal *Drills*

Photographs that Sell the Technical product



The McGRAW-HILL FIELD PHOTO SERVICE Department was organized some years ago in response to a widely felt need of furnishing a service through which advertisers could readily and economically secure striking installation pictures of their machines and apparatus in actual use. Approximately 700 McGRAW-HILL photographic representatives, locally distributed in all parts of the country, are now engaged in this work.

THESE photographers are carefully chosen for their prompt dependability in getting the picture they are asked to get—for their judgment shown in "taking" subjects to best advantage from an advertising standpoint—for their skill displayed in making photographs that reproduce effectively, and for their ability to get the news story while taking the picture.

This latter qualification is extremely important. Every effort is made to obtain the actual story of the machine on the job, and to assist in this we supply our photographers with carefully devised questionnaires to be filled out. The Field Photo Service Department always aims not only to get the picture but to get the story, and we make it a practice not to accept photographs from our photographers unless they are accompanied by the data.

THE advantages of this branch of McGRAW-HILL service to technical advertisers are obvious. Upon receipt of a list of installations we arrange all the interviews and secure the pictures. You are relieved of all worry and trouble and get your pictures and the story at minimum expense, besides having the satisfaction of putting the work into the hands of specialists on technical subjects.

MANY advertisers not only employ our Field Photo Service to secure definite lists of photographs, but give us a roving commission to take pictures of their machines wherever encountered.

IN connection with this department of McGRAW-HILL service we maintain a constantly growing library of stock negatives in the technical field. It contains at the present time about 3,000 photos, all of which are classified by subjects. Prints are promptly supplied at a moderate charge.

This Library of Technical Photographs is of special value to Advertising Agencies, a number of which frequently call upon its resources.

THE facilities of our organization for obtaining photographs of technical subjects are at the service of all who require such photographs. Primarily, however, it is an important link in the complete chain of McGRAW-HILL service to the technical advertiser. We not only write the proper copy for our advertisers, but we go out into the field for them and obtain pictures and stories which they are not in a position to get for themselves.

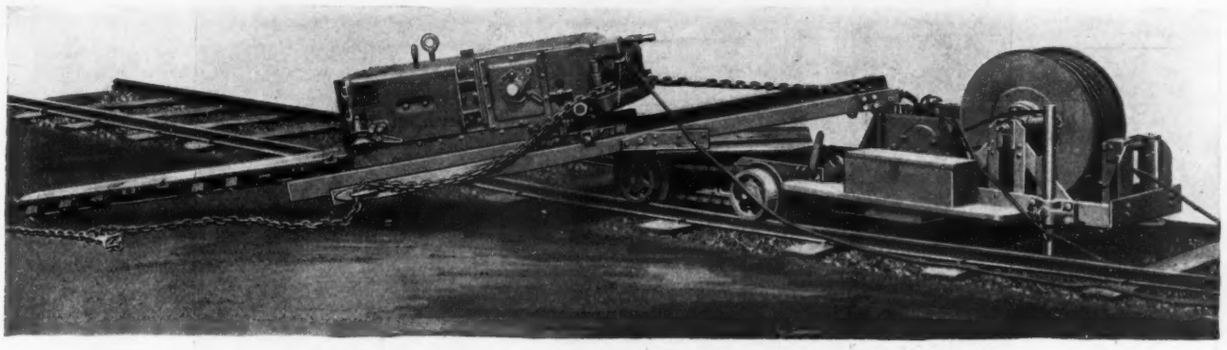
WE will gladly furnish detailed information regarding the cost and answer any questions.

McGraw-Hill Company, Inc.
Tenth Avenue, at 36th Street
New York City

Power Coal Age
American Machinist Electrical Merchandising
Electrical World Engineering and Mining Journal
Journal of Electricity Engineering News-Record
Ingenieria Internacional Electric Railway Journal
Chemical and Metallurgical Engineering

McGraw-Hill Field Photo Service
We photograph your product on the job anywhere, and get the story of its service Available photos also supplied from stock Specialists on technical subjects

TIP-TURN—the Time-saving Truck



Sullivan IRONCLAD on TIP-TURN Truck, showing Loading Position.

TIP-TURN is the New Time-saving Truck for Ironclads

At a Utah Mine where 4 or 5 places per shift is good cutting in the hard coal, a TIP-TURN Ironclad is cutting 14 places in 8 hours.

Unloading and loading time is cut down 25 to 50 per cent., with the TIP-TURN Truck.

Just swing the Ironclad on the turntable until it heads directly at the point you want to sump, throw in your feed chain and the Ironclad feeds forward down the easy incline formed by the drop-front, and is in position to move direct to the face without loss of time shifting jacks. The process is reversed in loading up.

TIP-TURN FEATURES

Self-winding Reel, with provision for winding cable, when machine is stationary. **Friction Drive,** with liberal surfaces, insuring close range of truck speeds on the track. You can creep inch by inch past bad switch points or run at a good 3 miles per hour on smooth track.

Ready Control. The arrangement of control levers permits easy handling without danger of accident.

Sturdy Design. TIP-TURN Trucks are staunchly designed and strongly built. They stand up under the heavy service for which they are intended.

Bulletin 73-UC

SULLIVAN MACHINERY COMPANY

122 SOUTH MICHIGAN AVE., CHICAGO, ILLINOIS U.S.A.

DOMESTIC SALES OFFICES:

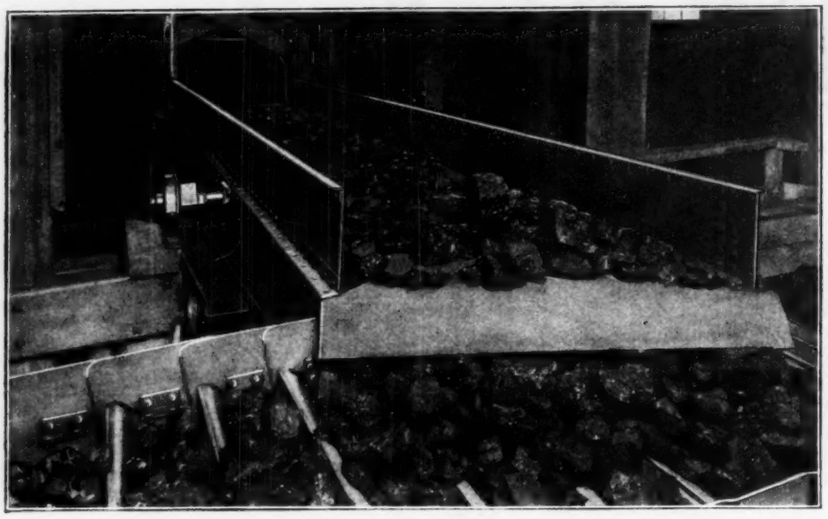
Birmingham, Boston, Butte, Claremont, N. H., Cleveland, Dallas, Denver, Duluth, El Paso, Huntington, W. Va., Joplin, Juneau, Knoxville, New York, Pittsburgh, St. Louis, Salt Lake, San Francisco, Spokane.

FOREIGN SALES OFFICES:

Algiers, Brussels, Calcutta, Christiania, Durban, Natal, Havana, Lima, London, Madrid, Mexico City, Paris, San Juan, Santiago, Shanghai, Sydney, N. S. W., Tokyo, Toronto, Tunis, Turin, Vancouver.

SULLIVAN PRODUCTS

Air Compressors; Air Lift Pumps; Diamond Drills; All-Hammer Drill Sharpeners; Drill Steel Furnaces; Forge Hammers; Ironclad Coal Cutters; Rock and Hammer Drills; Quarrying Machinery; Contractors for Diamond Core Drilling.



MODERN TIPPLE EQUIPMENT

Webster conveying and elevating equipment has deservedly won high recognition—because back of each installation is a fundamental principle of design and construction which is permanently reflected in its wonderful service performance and low operating costs.

Your delayed installation may present peculiar conditions—unusual obstacles—but these can be quickly overcome by Webster engineers, who represent a development in conveying practice far in advance of many present day problems. In this way is maintained the high standard that is looked for in Webster equipment.

If you have an elevator or conveying problem, why not solve it—NOW—with the assistance of experienced engineers, and a factory having the prestige of over forty years of successful manufacturing history.

Picking Tables
Conveyors
Crushers
Feeders
Etc., Etc.

Loading Booms
Screens
Car Hauls
Chutes
Etc., Etc.

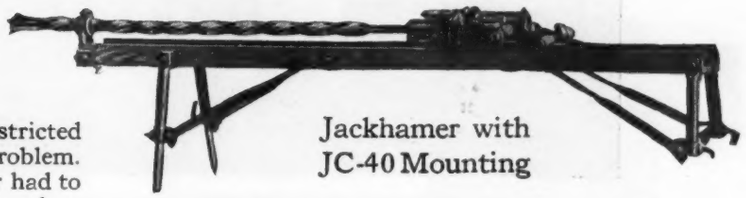
THE WEBSTER MFG. COMPANY
4500-4560 CORTLAND STREET
CHICAGO

FACTORIES
CHICAGO, TIFFIN, O., MICHIGAN CITY, IND.

SALES OFFICES
IN PRINCIPAL CITIES

Get after the narrow seams with JACKHAMERS

Jackhamers need no introduction to coal miners. Every year finds more of these compact and convenient hand hammer drills with their twisted steels. They can go in places where the heavier and more bulky machines cannot even enter. Then, too, it must also be remembered that Jackhamers are designed to drill any kind of rock and are fitted for the removal of dirt bands.



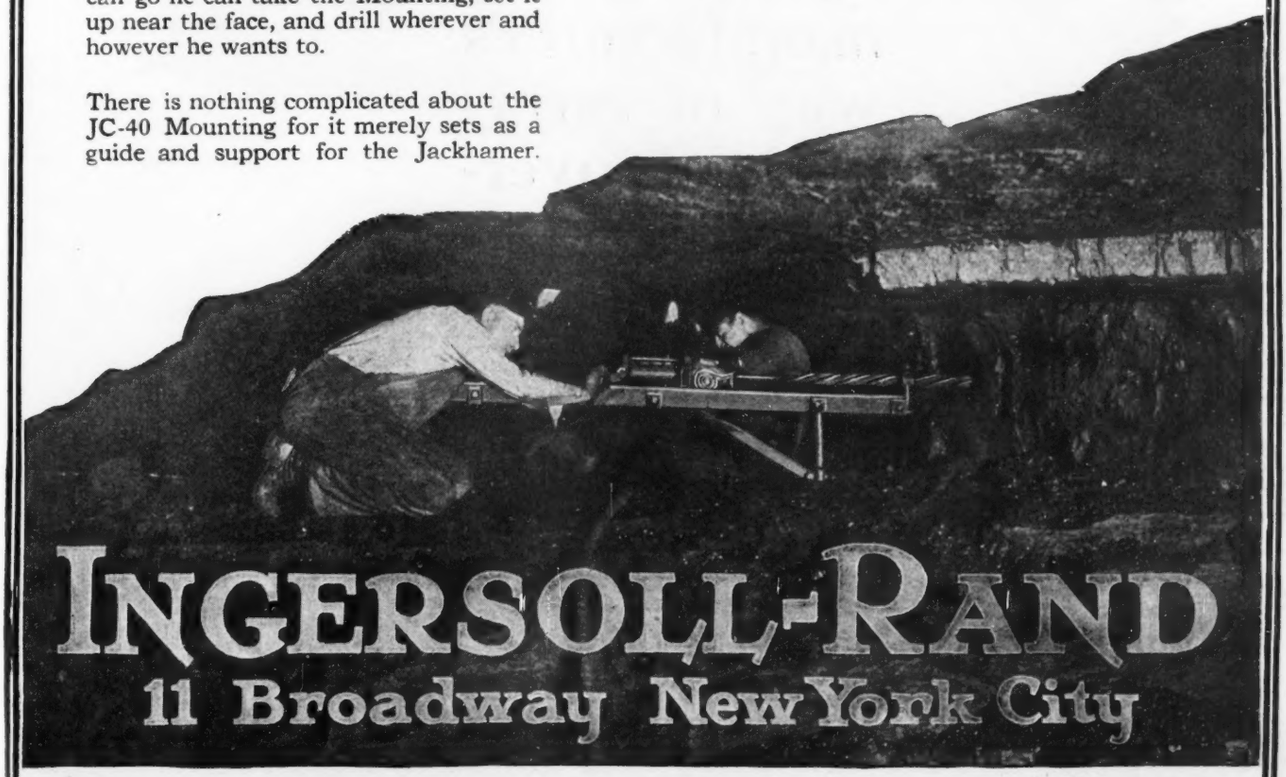
Jackhamer with JC-40 Mounting

The drilling of narrow seams in restricted chambers presents a difficult problem. Formerly either the drill operator had to be a contortionist or decrease his production. The JC-40 Mounting has solved this problem, for anywhere the miner can go he can take the Mounting, set it up near the face, and drill wherever and however he wants to.

There is nothing complicated about the JC-40 Mounting for it merely sets as a guide and support for the Jackhamer.

Bulletins 4321 and 4040 sent on request.

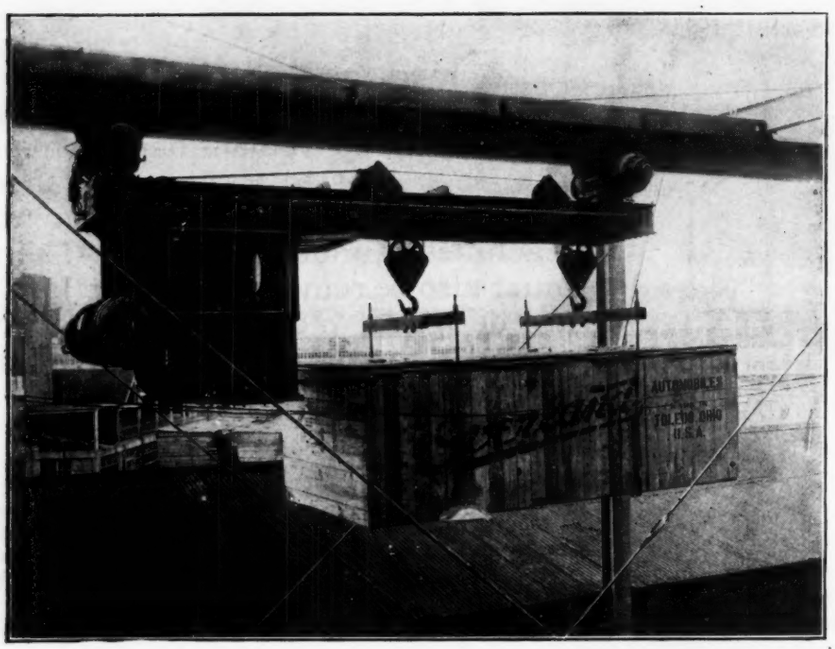
214-JD



INGERSOLL-RAND

11 Broadway New York City

EASE OF



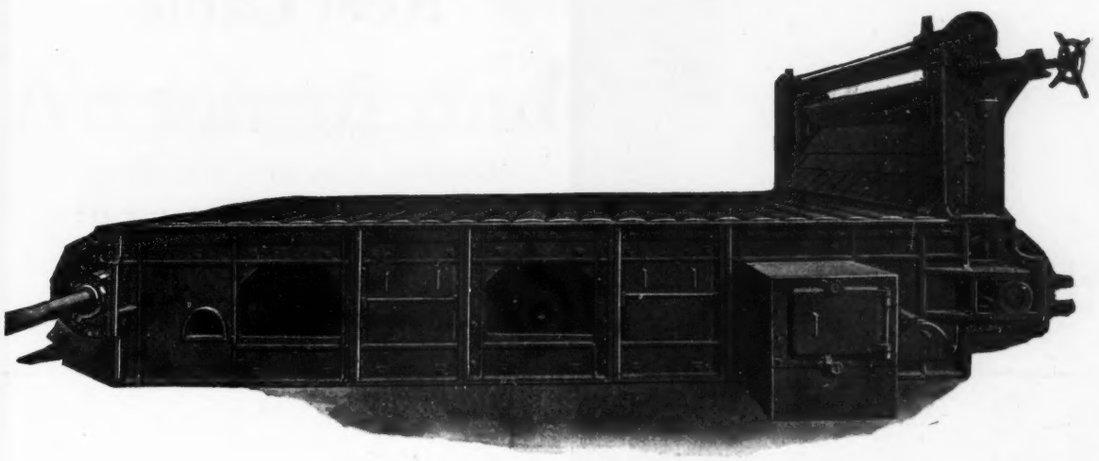
This is one big manufacturer's way of carrying loads overhead.

Economy
Capacity
Simplicity
Ease of Operation √
Ease of Installation

OPERATION

COXE STOKERS

will carry big overloads in the power plant and by burning low grade, low cost coals, cut down operating costs.



COMBUSTION ENGINEERING CORPORATION

11 Broadway, New York City

Owners and Manufacturers of

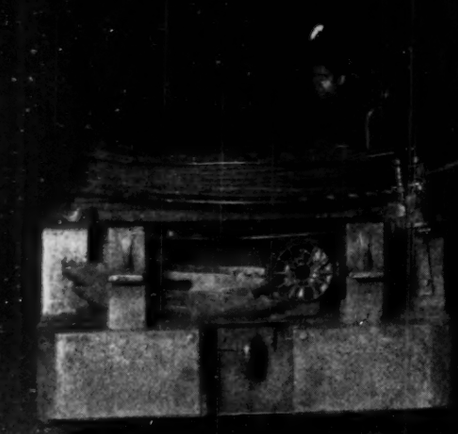
Type E Stokers—for Bituminous Coal | Lopulco Pulverized Fuel Systems | The Grieve Grate—Hand-Firing

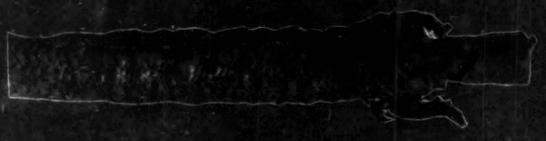
Coxe Stokers—Anthracite Coal and Coke Breeze

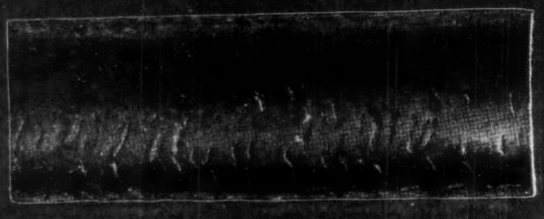
PHILADELPHIA, PA. PITTSBURGH, PA. MINNEAPOLIS, MINN. BIRMINGHAM, ALA.
HAZLETON, PA. BOSTON, MASS. CHICAGO, ILL. SALT LAKE CITY, UTAH ALBANY, N. Y.
DETROIT, MICH. OMAHA, NEB. DENVER, COLO. MILWAUKEE, WIS. ATLANTA, GA.
TAYLOR ENGINEERING CO., VANCOUVER, B. C.

HAZARD

"LORECA" REEL CABLE







Quality Survives

For the locomotive reel—

HAZARD "Loreca" Reel Cable

Durable—tough—flexible—waterproof. So constructed as to make peeling, stripping or splitting of either rubber or outer cover impossible.

Built for the most exacting mine service.

Full information and samples. Shall we send them?

Quality survives.

Hazard Manufacturing Co.

NEW YORK 533 Canal Street
CHICAGO 552 W. Adams Street
PITTSBURGH 1st Nat'l Bank Bldg.
DENVER 1415 Wazee Street

Wilkes-Barre, Pa.

Makers of Quality Wire Rope Since 1848

"The Waugh Way Wins"

Napoleon and the "Ninety"

NAPOLEON was a little man, but in ability, in energy and in endurance he was a giant. He worked fast; he worked thoroughly; and he achieved amazingly big successes.

THE new Waugh "Ninety" drills are also small in size, but in ability, endurance and capacity for faster, better work, and big successes they are like Napoleon.

WHETHER you operate a coal mine, a metal mine, or a stone quarry, you will want one of the three Waugh "Nineties" on the job at once. There is a "Ninety" specially designed to fit your needs. Send for our new "Ninety" booklet today. It will interest you.

THE Denver Rock Drill Manufacturing Co.

Denver, Colorado

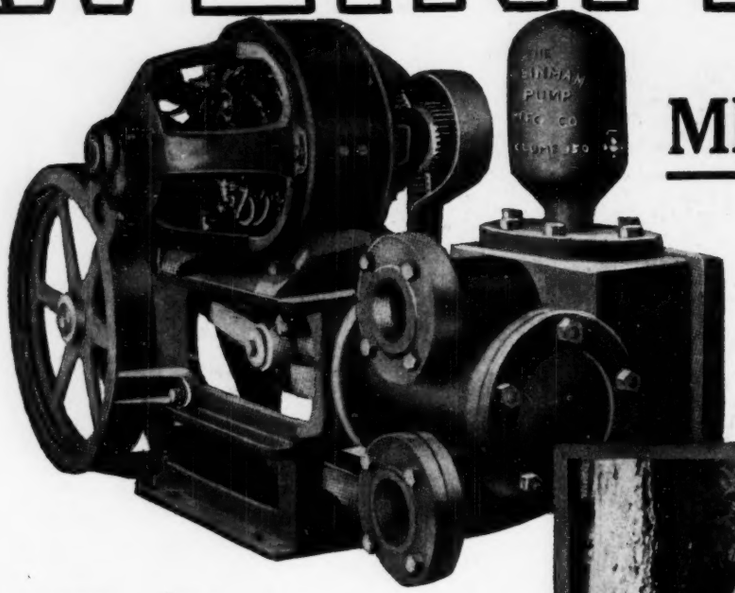
San Francisco, Scranton, El Paso, Los Angeles, Seattle, Duluth, Joplin, Wallace, Salt Lake City, Lima, Santiago, Butte, New York, Houghton, Birmingham, Melbourne, Johannesburg, Mexico City

Canadian Rock Drill Company, Limited

Sole Agents in Canada

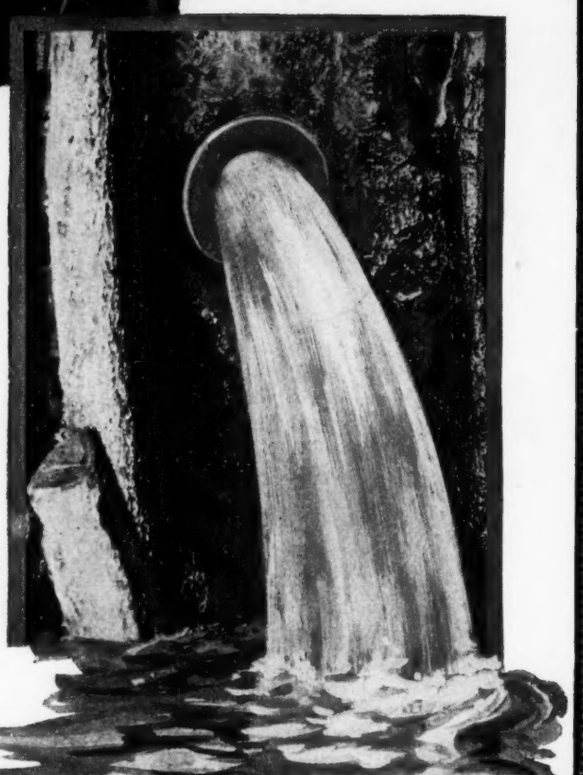
Toronto, Ont. Cobalt, Ont. Nelson, B. C. Vancouver, B. C.

"WEINMAN"



MINE PUMP

Back of the sure, steady, neverfailing flow—

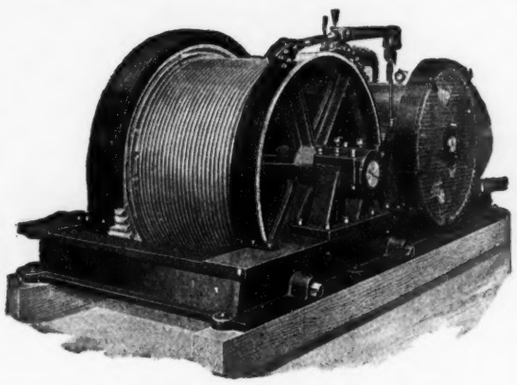


THE "Weinman" illustrated above, a 5-in. x 5-in. Mine Gathering Pump, 72 R.P.M., 60 gal. per minute, driven by a 5 H.P., 230 V., D.C. motor, is one of the latest designs.

This pump has a clear valve area equal to 40 per cent. of piston area, a guaranteed higher ratio than any other pump of this type on the market. Notice that access to both suction and discharge valves is obtained by the removal of ONE NUT, which holds hand plate in position. Pump is of the CENTER CRANK type, insuring equal distribution of the load, ease of operation and other advantages.

WEINMAN PUMP MFG. CO.
Columbus, Ohio
Write for our literature
REPRESENTATIVES:
Superior Supply Company, Bluefield, W. Va.
Banks Supply Company, Huntington, W. Va.
Anson Byrne Company, Chicago, Ill.
Weinman Pump & Supply Company, Pittsburgh, Penna.

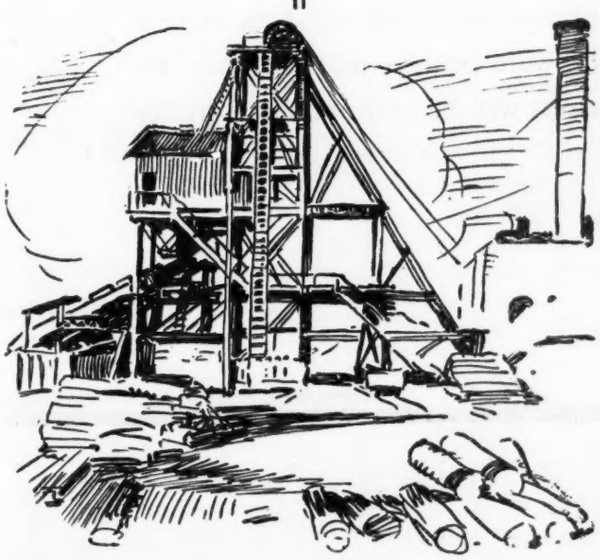
Thomas Mine Hoists



Thomas Hoists are built for mine service of all kinds. Because we have specialized in MINE HOISTS for more than a quarter century coal operators may confidently expect to procure here equipment which will fulfill every requirement of the particular condition.

Estimates will be gladly furnished those interested.

THOMAS ELEVATOR CO.
29 So. Hoyne Ave., Chicago, Ill.



Just Out!

Use the Coupon

—mine gases
—safety lamps
—mine ventilation
—safety and first aid
—explosive conditions

All the necessary help and information to pass the most rigid mine examination in any state.

1920 Beard's Mine Gases and Ventilation

433 *pages, pocket size, flexible,* $4.00 *net, postpaid.*

New Second Edition

This new second edition, entirely revised and greatly enlarged, covers mine gases, explosives in mines, mine rescue work and appliances, theory of ventilation, practical ventilation, and mine lamps and lighting—all the various problems of safe and efficient operation of coal mines.

You may examine this book FREE

Free Examination Coupon

McGraw-Hill Book Co., Inc., 239 West 39th St., New York.

You may send me on 10 days' approval **Beard's Mine Gases and Ventilation, $4.00 net, postpaid.**

I agree to pay for the book or return it postpaid within 10 days of receipt.

....I am a regular subscriber to Coal Age.

....I am a member of the A. I. M. M. E.

Signed .....

Address .....

Official Position .....

Name of Company .....

(Books sent on approval to retail customers in U. S. and Canada only.) C. 12-30-20

What will the Coal S

THIS vital question is being asked by men all over the country. The only comprehensive way to answer it is to make a complete review of past events and from these interpret the future.

This is exactly what Coal Age has done. Every phase of the coal situation has been most carefully reviewed. This review will appear in the Tenth Annual Review and Forecast Number of Coal Age, published January 20th, 1921.

Competent writers will tell facts about coal production, distribution, exports, prices, consumption, stocks and supplies as well as the truth about coal demand. This issue will also be a historical one. The story of how New England and the Northwest obtained their coal this year; of how the Interstate Commerce Commission has functioned in controlling the coal industries; what the service orders were, when they were issued, and what they accomplished. Special stress will be laid upon coal prices

Situation be in 1921?

for 1920 and their relation to prices of other commodities. From these facts an accurate forecast for 1921 has been made and all men interested in coal will find this to be of great help in formulating their future plans.

An Unusual Advertising Opportunity

THE facts included in the advertising pages—in your sales talk—will be looked forward to as much as those contained in the editorial pages.

The publication date — January 20—comes at a most opportune time. It is quite generally conceded that the purchase of an unusual amount of equipment will be made during the coming year and consequently this offers every manufacturer of equipment applicable to coal mine or coal field service, an opportunity to use big, attention-getting space with the utmost effiectiveness.

The information contained in your advertisement will be carefully studied. It will have a permanent value, because this issue will be kept for reference throughout the entire year.

Make
Space reservations
NOW

Use the **COUPON**

COAL AGE
Tenth Avenue at 36th Street, New York

Check your requirement on this coupon

Please reserve.....pages for our advertisement in your Annual Review and Forecast Number, published January 20, 1921.

Submit for our approval.....page advertising suggestion for use in your Annual Review and Forecast Number.

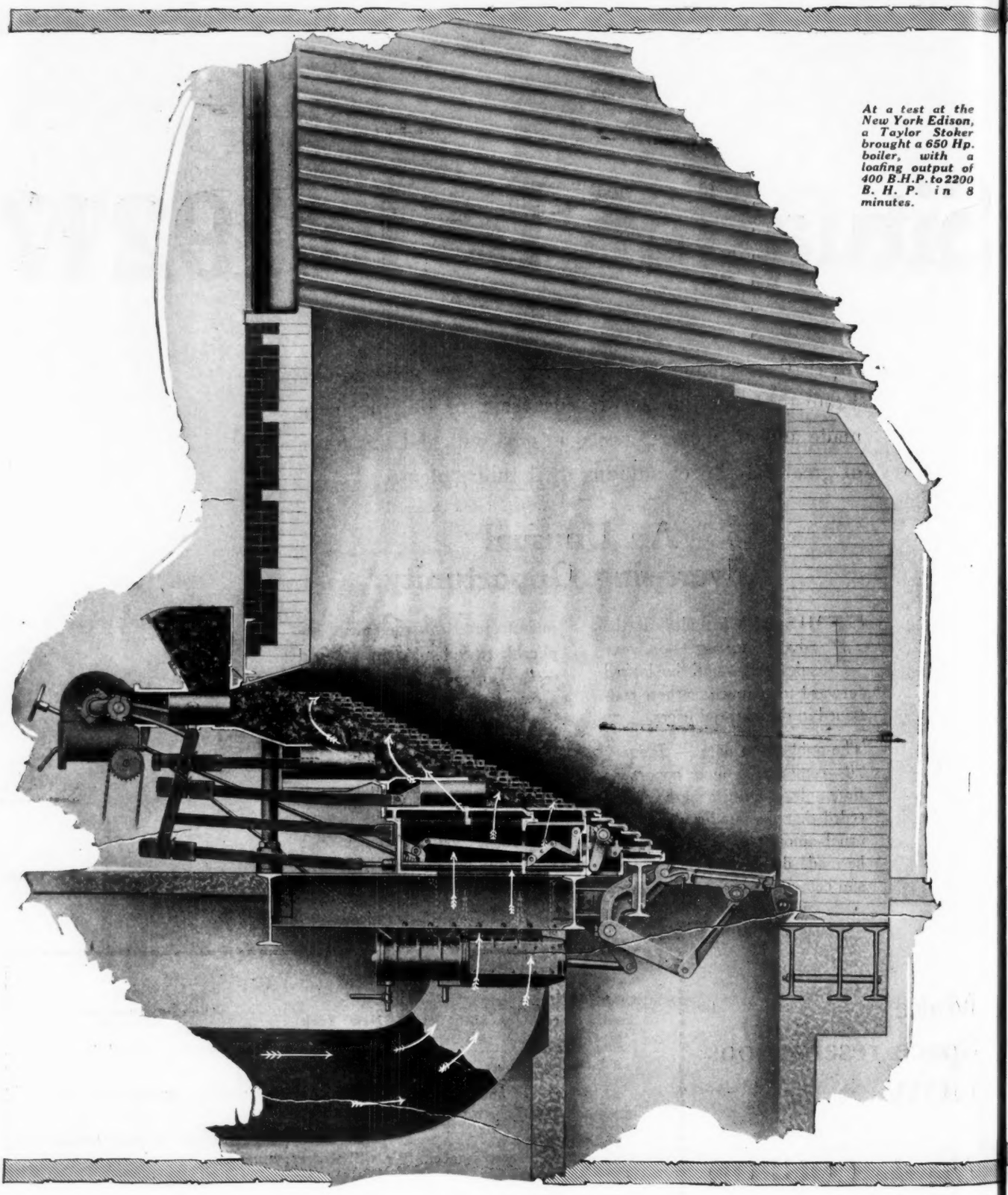
Reserve.....pages for our advertisement in your Annual Review and Forecast Number. We will send copy and cuts.

NAME OF COMPANY .....

ADDRESS .....

SIGNED BY.....

Adv. rates in Review Number: 2 pages $300; 1 page $150; ½ page $75
Contract rates to regular advertisers.



At a test at the New York Edison, a Taylor Stoker brought a 650 Hp. boiler, with a loafing output of 400 B.H.P. to 2200 B. H. P. in 8 minutes.

The Taylor Stoker equipped with Power Dump.
Completely mechanicalizes the conversion of coal into steam.

The Taylor Stoker Carries a Thicker Fuel Bed than Any Other System

Because it is designed with deeper retorts than any other stoker. In these deep retorts two and sometimes three rams pack the fuel to the proper degree of compactness so that when it reaches the tuyere level, the fuel spreads over the entire furnace area in a deep, compact, yet porous fire-bed.

This fact has three important results:

(*a*) The coal cokes more slowly releasing all the volatile gases. These are promptly and intimately mixed with air while passing through the thick bed of fuel into the combustion zone where they are completely burned.

(*b*) The thick mass of coke on the grates is ready for emergencies. When an increased air supply is sent through this mass, the Taylor Stokered boiler can be lifted from rated capacity, or from a banked condition, to 200% or 300% of rating in a few minutes.

(*c*) The grate surface is always protected by green coal.

Taylor Stoker users find that they can maintain higher efficiencies than with any other firing system, whether operating at rating or at high overratings—and with less effort.

If you are interested in further information, drop us a line for the interesting booklet "Today's Problems and The Taylor Stoker"

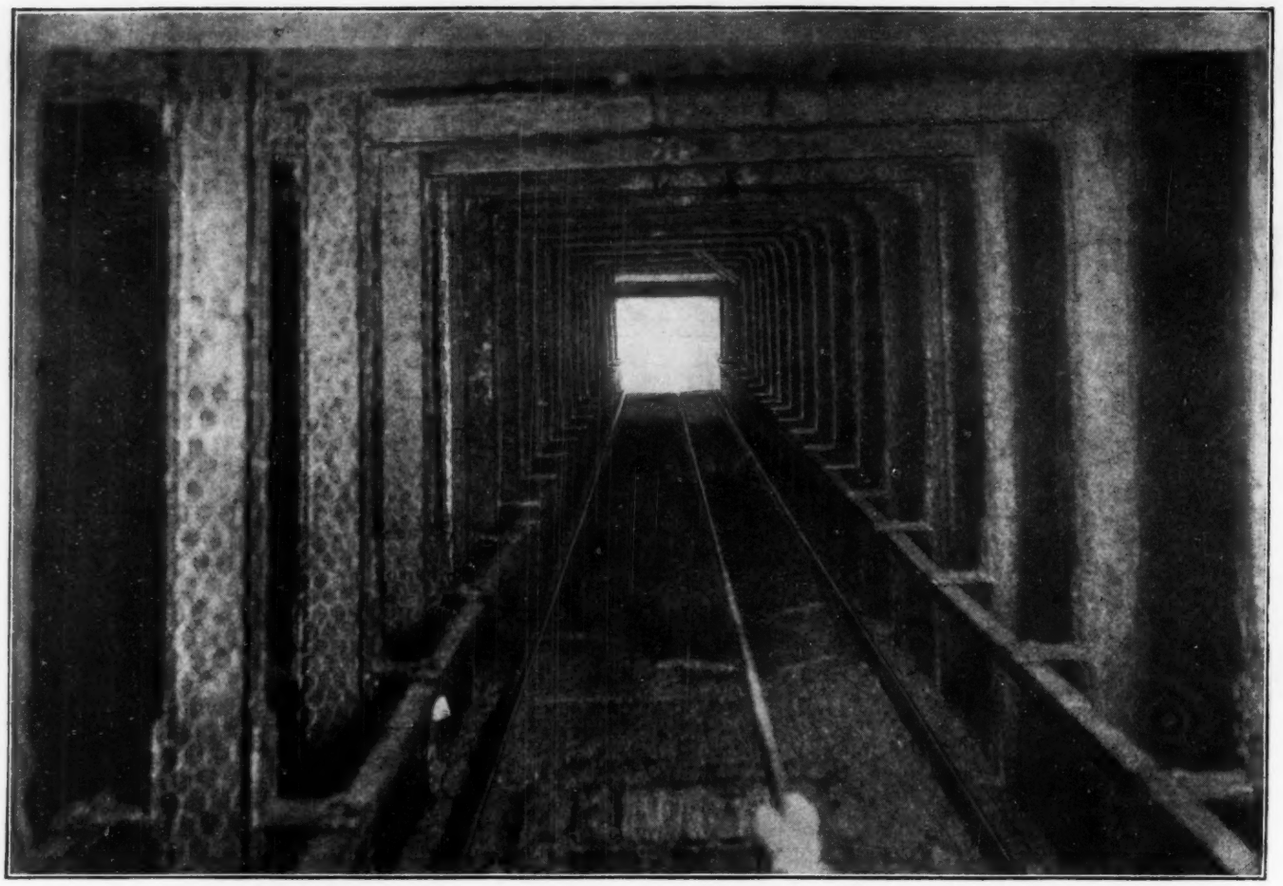
American Engineering Company

Philadelphia, Pa.

Taylor Stoker Co., Ltd., 416 Phillips Place, Montreal, Canada.

Builders of

The Taylor Stoker



Gunite Affords a Positive Means of Protecting Steel Timbers

The economy of steel timbers lies in their increased life, which means less replacements and the accompanying reduction of time and monetary losses.

But the life of unprotected steel timbers is problematical; it is to a great degree dependent upon the percentage of moisture in your mine.

Gunite, however, the Sand Cement Product of the "Cement-Gun," successfully withstands the corrosive action of gases and resists the effects of moisture. It absolutely seals timbers from those injurious elements and, moreover, is easily applied.

Furthermore the "Gun" may be used to advantage anywhere and has proved a most economical means of eliminating dust explosions, slate falls, as well as building walls and brattices.

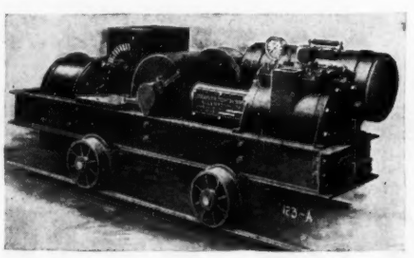
And what the "Cement-Gun" has done in protecting the shaft-timbers for the Pickards Mather Company it can do for you. Let us tell you more about its uses.

The cement-gun is not a restricted article. It may be purchased outright from us and used by anyone.

Cement-Gun Company, Inc.

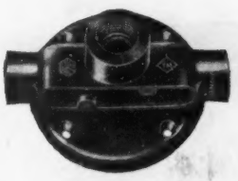
Cornwells, Bucks County, Pa.

Branches: New York City, 30 Church St.; Pittsburgh, 211 Fulton Bldg.; Chicago, Ill., 904 Chamber of Commerce Bldg.; Los Angeles, Citizens Bank Bldg.; Richmond, Va., 812 Va. Ry. & Power Bldg.; Kansas City Office: 204 R. A. Long Bldg.; Canada (East of Alberta), The General Supply Co., Ltd.; 360 Sparks St., Ottawa, and 85 Water St.; Winnipeg, Man., Canada, British Columbia and Alberta; 615 Mohawk Block, Wash. Agencies in all principal foreign countries.



We sell Traylor Mine Type Compressors.

CONDULETS



Type TM

Type LFM

Type LFN

Flanged Obround Condulets

FOR goose neck bracket or similar installations, supporting the device to the floor, wall or ceiling, entrance of conduit system into cold storage, refrigerating or similar rooms, Flanged Obround Condulets fulfill every requirement.

By use of a gasket under the flange, holes for passage of the conduit through walls, partitions or floors may be made absolutely water tight.

Send for Condulet Catalog.

CROUSE-HINDS COMPANY

SYRACUSE, N. Y.

BOSTON NEW YORK CHICAGO

Condulets Panelboards
Knife Switches Floodlights
Guy Anchors

1583

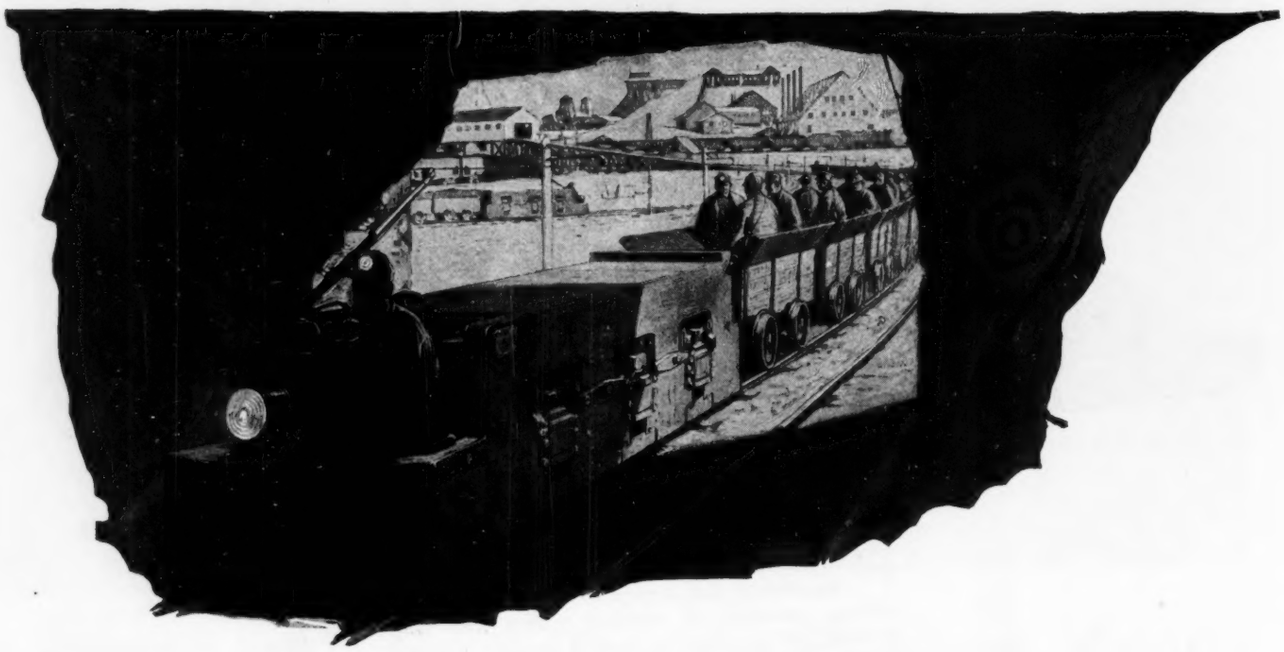
Type TMD

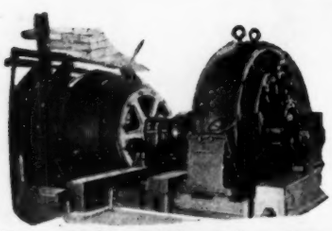
Type DF

Condulet the Job

CROUSE-HINDS

In the basic industries of this country, without which other industries could not exist, electricity is the dominant factor in rapid and economical development





Motor driving double conical drum hoist in main shaft—hoisting at its best.

Direct-connected motor driven pump—dependable operation under severe service conditions.

Motor driving shaker screen and picking table facilitates greater production.

The "Black Diamond" Miner's Best Helper

When a coal miner clamps on his electric headlight jumps aboard an "empty," and rolls smoothly along the "motor road" into the mine, his electric day has only begun.

Down in the mine, an electric spark ignites the blasting charge which tears away rock and opens the vein—an electric drill helps him cut his coal. While he works, electric light brightens all operation—electric pumps draw flood water from his path—electric fans supply him with fresh air, increasing his efficiency and protecting him from dangerous smoke and gases.

Electricity is everywhere—readily applied and easily controlled—operating small locomotives for gathering work, large locomotives for heavy haulage, hoists, car dumpers, and other machines.

The engineering and manufacturing facilities of the General Electric Company which so thoroughly filled the electrical needs of the Coal Industry are at the disposal of all industries.

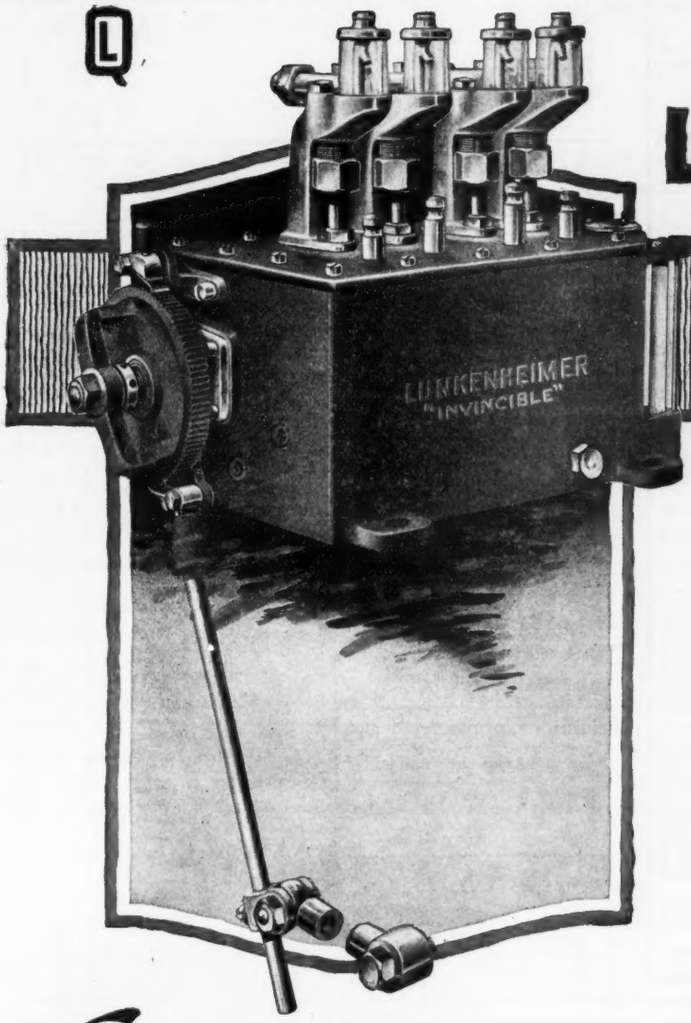
General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

LUNKENHEIMER

CYLINDER LUBRICATORS



AMERICA'S BEST
LUNKENHEIMER
"QUALITY"
SINCE 1862

For Steam and Oil Engine, Pump and Air Compressor Cylinders

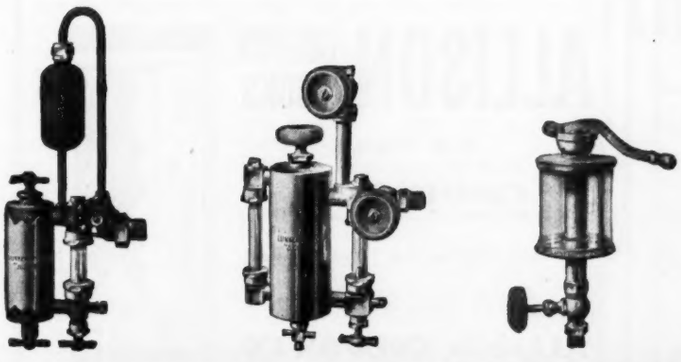
Dependable lubrication,—the delivery of the proper quantity of oil to the cylinders—is assured when power units are equipped with Lunkenheimer Cylinder Lubricators. They are positive in operation, delivering uniformly until reservoir is empty the exact quantity of oil for which the feed is set.

The feed regulation permits of close adjustment, the oil drops form perfectly and are clearly visible in the large sight-feeds. Lunkenheimer Cylinder Lubricators are made in a variety of types, including Hydrostatic, Hand and Mechanically operated,—practical in design, and durable because of the high quality materials used. All the parts are interchangeable and can be renewed should necessity require.

Equip with "LUNKENHEIMER" CYLINDER LUBRICATORS and satisfactory service is assured.

Write for descriptive booklets No. 526 — J. and 572—J.

Their installation means permanence; their simplicity and durability—continuous service



THE LUNKENHEIMER CO.
"QUALITY"

Largest Manufacturers of
High Grade Engineering Specialties
in the World

CINCINNATI

New York Chicago Boston London

Export Dept: 129-135 Lafayette St., New York

22-14-0

Directory of Consulting Engineers

Allen & Garcia Company

Andrews Allen, C. E.
John Garcia, E. M.

Consulting and Constructing Engineers.

Designers and Constructors of complete coal mines, washers, tipples, rescreening plants, etc. Electrification of Coal Mines a Specialty. Examinations, reports, and appraisals, coal mining and other properties.
21 East Van Buren St.
Isabella Building, Chicago.

Baton & Elliott

Engineers.
Examinations and Reports on Coal Properties. Design and Supervision of Construction of Coal Plants.
1st Nat.Bk.Bldg.,Pittsburgh, Pa.

Caldwell, Tonkin and Pealer

J. R. Caldwell
Mining Engineer.
Thos. Pealer,
ASSOC. M.A.M.SOC.C.E.Civil Engr.
R. D. Tonkin,
Cruiser
Valuation Engineers.
Authoritative Reports and Valuations Covering Coal Mining Plants, Coal Fields and Timber Lands.
Indiana, Pa.

Card Iron Works The C.S. Co.

Consulting and Mech. Engineers.
Designers and Builders of Complete Mine Coal Handling Equipment.
Established 1892. Denver, Colo.

Chance, H. M. & Co.

Consulting Mining Engineers and Geologists.
Coal and Iron.
Drexel Bldg., Philadelphia, Pa.

Crichton, Andrew B.

Mining Engineer.
Examine and report on Coal properties. Coal estates managed. Cost systems installed. Construction of Mining plants. Surveys and Maps.
Johnstown, Pa.

Crichton, Walter G.

Mining Engineer.
Examination and reports on coal properties. Coal leasehold properties managed. Installation of proper mining systems.
Surveys and Maps.
Charleston, W. Va.

Cunningham, W. H.

Consulting Mining Engineer and Geologist. Design and Construction Coal Plants, Examinations, Valuation, Reports and Surveys of Coal, Oil and MetalProperties.
Rooms 800-802 First National Bank Bldg., Huntington, W. Va.

Dunn, C.C.

Consulting Civil and Mining Engineer.
Examinations and Reports on Coal Lands, Coal Mines, Railways and Structures.
Room 703, Robson-Prichard Bldg., Huntington, W. Va.

Eavenson, Howard N.

Mining Engineer.
Examination and Reports on Coal Properties — Design and Construction of Coal Plants — Valuations — Improvements of Existing Properties.
Union Arcade Bldg., Pittsburgh, Pa.

Evans, C. G.

Mining Engineer.
Examination and Reports on Coal Properties. Design and Supervision of Construction Coal Plants. Surveys and Maps.
Rooms 5-6 First Nat'l. Bank Bldg., Pikeville, Ky.

Evans, Geo. Watkin

Consulting Mining Engineer.
Geological Surveys, Operating and Valuation Examinations of Coal Mines.
Western Coal Fields a Specialty.
2207 L. C. Smith Bldg.,
Seattle, Wash.

Haulton, Thos.

Consulting Engineer.
Specializing, Mechanical and Electrical Mining Equipment.
304 Swank Bldg., Johnstown, Pa.
Telephones, Bell: 155.
Johnstown: 5884.

Hoffacker, B. F.

Engineer and Geologist.
Park Bldg., Pittsburgh, Pa.

Hoyt, W. E.

Wood Preserving Engineer.
Supervision of treatment of timber and structures, supplying oils and equipment for brush, spray, and open-tank methods.
Fulton Bldg., Pittsburgh, Pa.

Hess, E. W.

Engineer.
M. Am. Soc. C.E.
M. Am. Inst. M.E.
Mine Surveys and Reports.
Coal and Fire Clay Development
Clearfield, Pa., Kratzer Bldg.
Dubois, Pa., Deposit Bank Bldg.
O. P. Hess, M. Inst. M.E.

Krehbiel Company

Engineers—Constructors.
Complete coal mine top works.
Electrification of coal mines.
Tipples, horizontal screens.
Power generation and distribution. Send for catalog C.
Marquette Building, Chicago.

Lewis, Harry J.

Civil Engineer.
Designs and Constructs Mechanical Equipment of Mines. Examination and Reports on Mining Properties.
336 Fourth Ave., Pittsburgh, Pa.

Means, The Charles M., Co.

Consulting Engineers.
96 West St., New York. Oliver Pldg. Pittsburgh.

Moore & Co, W. E.

Engineers
Power Plants
Heavy Transmission
Pumping Stations
Tranamission Lines
Union Bank Bldg.,
Pittsburgh, Pa.

Pill, John R.

Consulting Engineer
Examinations and Reports on Mining Properties.
623 First National Bank Bldg.
Birmingham, Ala.

Porter, Horace C.

Chemical Engineer, Fuel Testing.
Coal Valuation and Tests, Ash Fusibility, Gas and By-Product Yields, Investigations at Mine or Plant.
1833 Chestnut St., Philadelphia

DIRECTORY RATES:

1½-inch card

$26.00 per quarter

($25.25 for advertising and 75 cts. for subscription)

¾-inch card

$15.00 per quarter

($14.25 for advertising and 75 cts. for subscription)

Minimum order, 3 months

Orvis C. Hoffman Leon H. Hoffman

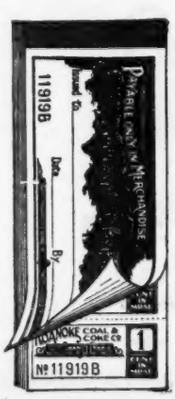
DIAMOND-CORE-DRILLING
—CONTRACTORS—
HOFFMAN BROS.
PUNXSUTAWNEY, PA.
(Our Specialty—Testing Bituminous Coal Lands)
Up-To-Date Equipments. Expert Drill Runners. Inquiries Solicited

The Koppers Company Laboratories
PITTSBURGH, PA.
Examination of Coal for By-Product Recovery, Investigations in By-Product Coke and Gas Manufacture, Ammonia, Tar, Benzols, Gasoline, Refractory Materials

ASBESTOS

We are miners and shippers of Crude Asbestos in any quantity. We produce all grades at our world-famous BELL ASBESTOS MINES, in Canada. We also card fibres, spin yarns, weave cloths, and make all sorts of Asbestos products.
For anything you want in Asbestos, turn to
KEASBEY & MATTISON COMPANY
Dept. S-6, AMBLER, PENNA. U. S. A.
Owners of the World's Largest Asbestos Mines

ALLISON COUPON BOOKS
FOR YOUR
COMMISSARY
There is ONE Better Than the Rest
ASK FOR SAMPLE
ALLISON COUPON CO.
INDIANAPOLIS, IND.



Directory of Consulting Engineers

Osborn, L. A.
Mining & Construction Engineer
Coal Properties Examined and Reported upon. Mining Plants Designed and Erection Supervised. Properties Surveyed and Mapped.
Map of the "Pocahontas Coal Fields and Adjacent Territory" showing Operations and Mining Properties in Different Colors. Price $10.00.
Welch, West Va.

Randolph, H. F.
Consulting Electrical Engineer.
Electrical Construction, Supervision, Examinations.
2327-28-29 Oliver Bldg., Pittsburgh, Penna

Read Company R. G.
Engineers and Contractors
Coal Tipples and Complete Plants for Handling Coal and Coke, Including Steel and Concrete Structures. Designed Furnished and Erected.
Fisher Building, Chicago

Stuart, James & Cooke
Engineers
Room 1010-11 25 Beaver St.
New York

Tate, H. E.,
Insurance Engineer
Inspections, Reports, Rate analysis and Recommendations.
P. O. Box 12
Pikeville, Kentucky.

Van Valzah, H. F.
Mining Engineer.
Coal and Clay.
Rooms 7 and 8 Kurtz Bldg., Clearfield, Pa.

Wadleigh, F. R.
Consulting Engineer.
Coal and Coke
1418 Walnut St., Phila., Pa.

Wehr & Walden
Consulting Engineers.
Electrification, Designing, Construction, Steam, Gas, Hydraulics, Water-Works, Filtration, Public Utility, and Appraisal.
100 W. Fayette St., Baltimore, Maryland.

Wilkins Co., The W. G.
Engineers and Architects
Examinations and Reports on Coal Properties, Design and Supervision of Construction of Coal Mining and Coke Plants.
Westinghouse Building, Pittsburgh, Pa.

Wilson, Edwards F.
Analytical & Consulting Chemist
Coals, Cokes, Clays, Limestones, Industrial Waters, etc.
General Chemical Service to Producers and Consumers of Coal and Coke.
222 South 3rd St., Philadelphia

Wolfersperger J. J.
Consulting Mining Engineer
Examinations and Reports
731 Cooper Bldg., Denver, Colo.

Watching

This directory grow from week to week through the addition of new cards ought to be a very strong recommendation to consulting engineers not already represented in these pages.

Inspecting and Testing Engineers

Hochstadter Laboratories
Chemists and Chemical Engineer
Testing of Coal, Coke, and Fuels a specialty. General Chemical analyses and reports.
227 Front St., New York City

Pittsburgh Testing Laboratory
Inspecting Engineers and Chemists
Analyses and Tests of:
Coal and Coke, Gas, Water Clay, etc.
612 Grant Street,
Pittsburgh, Pa.

Security Laboratories
Coal Analyses.
For the Prospector—Producer and Consumer.
Send Large Representative Samples.
Joliet Nat'l Bank Bldg., Joliet, Ill.

"Opportunity" Advertising: Think "Searchlight" First!

WYCKOFF

WOOD PIPE

Instead of renewing your costly iron pipe—

Install Wyckoff Wood Pipe, the pipe that has been making good in mine service for the last half century.

Its faculty for resisting the action of sulphurous water is the reason for this—

Incidentally, it's the reason why Wyckoff Wood Pipe is in service in 90% of the Anthracite Mines and at least 60% of the Bituminous in the country.

So if you seek a pipe of proven durability, Wyckoff Wood Pipe is that pipe—

As our engineers will prove to your satisfaction if you will take advantage of their cooperation.

A. WYCKOFF & SON COMPANY
ELMIRA, N. Y.

Branches: Atlanta, Ga. H. H. White, 1503—4th Nat'l Bank Bldg. Pittsburgh, Pa. Johnson-Peter, Pittsburgh Terminal Warehouse. Scranton, Pa. Valley Supply Co., Coal Exchange Bldg.

G.H. ELMORE
ENGINEER

JIGGING MACHINES FOR WASHING COAL

ACID-PROOF AND ACID-RESISTING CENTRIFUGAL PUMPS

CLEAN COAL

EMERGENCY COAL WASHING EQUIPMENT

CONTINUOUS CENTRIFUGAL COAL-DRYERS

ELMORE

PHILADELPHIA
BRANCH OFFICE & WAREHOUSE AT SCRANTON, PA.

FULTON'S FAMOUS FIREPROOF
4F BRAND 4F BRAND 4F BRAND
MADE IN U. S. A.
Trade-Mark Registered in U. S. Patent Office.

Non-Inflammable Jute Brattice Cloth
Sold by Better Jobbers in all Coal Fields.
The most satisfactory and economical Brattice cloth on the market.
Made strongest—wears longest.
Ask for sample of FFFF No. 8 JUTE DUCK.
JUTE DUCK WILL REDUCE YOUR SUPPLY BILLS.
Manufactured only by
FULTON BAG & COTTON MILLS
Established 1870.
330 Wythe Ave., Brooklyn, New York City
Atlanta New Orleans St. Louis Dallas Oklahoma City

APOLLO-KEYSTONE
COPPER STEEL
Galvanized
Sheets

Highest in quality and rust resistance. Unequaled for Culverts, Flumes, Tanks, Roofing, Siding, Spouting, and all exposed sheet metal work.
We manufacture Sheet and Tin Mill Products of every description—Black and Galvanized Sheets, Corrugated and Formed Products, Roofing Tin Plates, Etc.
AMERICAN SHEET AND TIN PLATE COMPANY, Pittsburgh, Pa.

Mitchell Electric Vibrating Screen

The big advance in the development of screening devices, achieved by the Mitchell, is the application of power from *beneath* the screen at a high frequency of vibration and with a powerful impact. Continuous operation under the most arduous conditions is daily proving the correctness, of Mitchell construction.

Write us for complete details.

Stimpson Equipment Company
Manufacturers and Sole Agents
Felt Bldg., Salt Lake City, Utah

WATER
Softeners & Filters
Iron and Oil Removal Apparatus—Filtration Equipment—Water Conditioning Apparatus of every description
The Permutit Company
440 Fourth Ave. New York

Who Looks into the Earth
We test Coal and Ore land in any part of North or South America
Pennsylvania Drilling Co.
Diamond Drill Contractors
1812 W. Carson St. Pittsburgh, Pa. Phone Walnut 83
2623 Whitehall Bldg. New York.

CHIPPING
WILLSON GOGGLES
REG. U.S. PAT. OFF.

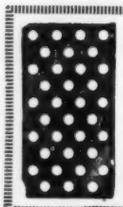
WELDING
ASK FOR CATALOG
Willson Goggles Inc. Factory and Main Offices, Reading, Pa.

SCREENS OF ALL KINDS
Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

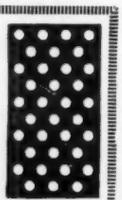
DIAMOND
CORE DRILLING
Accuracy Since 1884 Reliability
Booklet 122-C
SULLIVAN MACHINERY CO.
122 S. Michigan Ave., Chicago

DIAMOND CORE DRILLING
Write or Wire Your Inquiries.
DIAMOND DRILLING & EXPLORATION CO.
C. C. Hoover, Pres. and Gen. Mgr.
(Formerly Diamond Drilling Dept., Birdsboro Steel Fdry. & Machine Co.)
Deposit National Bank Bldg., Du Bois, Pa.

BUFF Mining Transits and Levels
The "Buff" is the result of 50 years of instrument study by our Mr. Geo. L. Buff—our present manager.
Send for catalogue 29.
Buff & Buff Mfg. Co., Jamaica Plain Stat'n, Mass.
Chicago, 231 No. Wells St.
Hudson Terminal Bldg., 46 Dey St., New York.



Perforated Metal Screens
Any Metal
Any Style Perforation
Pittsburgh Perforating Co.
3221 Spruce Way, Pittsburgh, Pa.



HANS OLSON, Pres. JNO. A. FISHER, Secy.
Punxsutawney Drilling and Contracting Company
DIAMOND DRILL CONTRACTORS
Testing Bituminous Coal Lands a Specialty
Weber Bldg. PUNXSUTAWNEY, PA.

COAL AGE

Think "SEARCHLIGHT" First

ADVERTISING RATES

POSITIONS VACANT—Business Opportunities and other undisplayed ads, 8 cents a word, minimum $2.00 an insertion.

POSITIONS WANTED—Evening work wanted, tutoring and other undisplayed ads of individuals looking for employment, 4 cents a word, minimum 75 cents, payable in advance.

ADD 5 WORDS for box number in undisplayed ads if replies are to any of our offices. There is no extra charge for forwarding replies.

DISCOUNT OF 10% if one payment is made in advance for 4 consecutive insertions of undisplayed ad.

ADS IN DISPLAY TYPE—Space is sold by the inch (30 in. to a page), the price depending upon total space used within a year, some space to be used each issue.

RATE PER INCH for ads in display space:

1 to 3 in., $4.50 an in.	15 to 29 in., $3.90 an in.
4 to 7 in., $4.30 an in.	30 to 49 in., $3.80 an in.
8 to 14 in., $4.10 an in.	50 to 99 in., $3.70 an in.

EMPLOYMENT

POSITIONS VACANT

POSITIONS WANTED

POSITIONS VACANT

A well-established wholesale house has an opening for a live wire to act as buyer and field man in western Pennsylvania and northern West Virginia. State age and experience and qualifications. P-759, Coal Age, Real Estate Trust Bldg., Philadelphia.

MINING engineers, chainman, and map draftsmen wanted for mining operations in southeastern Kentucky. Prefer men of technical training, who have had some practical experience. State age, qualifications, and least salary considered. Address, Chief Engineer, The McKinney Steel Company, Wolfpit, Kentucky.

EMPLOYMENT AGENCY

SALES engineer, must be technical graduate, experienced in coal mining machinery and have had some sales experience; location, Kentucky; salary up to $250 month and bonus. The Engineering Agency, 1662 Monadnock Block, Chicago.

TWENTY-EIGHTH YEAR

Positions for ENGINEERS, TRANSITMEN and DRAFTSMEN for Coal Mines.
No advance fee.
THE ENGINEERING AGENCY, Inc.
Monadnock Block, Chicago, Ill.

POSITIONS WANTED

ENGINEERING executive wishes to make; 16 years' experience construction and operation, especially coal handling; technical graduate; salary $7,500. PW-814, Coal Age.

EXPERIENCED mine surveyor, good draftsman, desires position with coal company. Only parties desiring competent man and willing to pay salary for same need reply. PW-803, Coal Age, Real Estate Trust Bldg., Philadelphia.

MARRIED man, age 42; 14 years' experience on pay rolls, coal billings, paymaster and general office work; wants change from present position. Experienced in handling office help and outside men. A pleasing personality, capable, energetic, with first class service acquired. PW-816, Coal Age, Lead-News Bldg., Cleveland.

PURCHASING agent and supply accountant; 15 years' experience, now employed. Minimum salary, $250. PW-453, Coal Age, Leader-News Bldg., Cleveland.

AGENTS AND SALESMEN

Manufacturers' Agent Available
To represent in the anthracite field as manufacturers' agent, any concerns handling mine equipment and supplies by consulting engineer with established clientele. AS-813, Coal Age, Real Estate Trust Bldg., Philadelphia.

AGENTS AND SALESMEN

Salesman Wanted
A wholesaler and operator with large tonnage of steam coal wants a wide awake salesman with established trade in Pennsylvania and New York State. Good future for ambitious hustler. AS-760, Coal Age, Real Estate Trust Bldg., Philadelphia.

WILL BUY
LEASE AND EQUIPMENT
OF OPERATING MINE

producing fifty to three hundred tons per day in Pennsylvania, Northern West Virginia or No. 8 Ohio. Give detailed description, seam of coal and particulars of equipment with lowest cash price. No brokers.

Woodruff Coal & Iron Co.
244 Oliver Bldg., Pittsburgh, Pa.

What you don't see—

The particular item you want may not be among the ads appearing. Try an ad yourself.

"SEARCHLIGHT"

will find just what you want among the many equipment owners who keep their eyes on this opportunity center.

UNDISPLAYED
8 Cents a Word
Minimum $2.00 an Insertion

DISPLAYED
$5.00 or Less Per Inch

10

Coal Lands and Mines For Sale

45,000 Acres in Bell, Knox and Whitley Counties, Ky.

Property was originally purchased by **Louisville & Nashville R. R. Co.** and subsequently transferred to **Louisville Property Co.**, a subsidiary of **Louisville & Nashville R. R. Co.**, which subsidiary company assigned same to United States Trust Co., of Louisville, Ky., for purpose of sale of property under orders of court.

If interested communicate with us.

United States Trust Co., *Assignee*
Louisville Property Co., 5th and Main Sts., Louisville, Ky.

WANTED

6 to 8 ton, 250 volt, 42-in. gauge Baldwin Westinghouse or General Electric

LOCOMOTIVES

Casey-Moorhead Engineering Co.
Bessemer Building, Pittsburgh, Pa.

WANTED

Engine Generator Sets

2—250 or 300 K.W. or larger generators, 250 volts, direct current, directly connected to simple engines (not compound), either 4 valve, piston valve or Unaflow type.

Give name of manufacturer, shop number, age, condition, floor space occupied, and all other information at hand.

Madison Coal Corporation
Purchasing Department
908 S. Michigan Ave., Chicago, Ill.

WANTED

6 ton, 42-in. gauge, Jeffrey, 250 volt

LOCOMOTIVE

fitted with crab reel.

H. T. LAMBERT COMPANY
Huntington, West Virginia

8,000 Stretchers

U. S. ARMY STANDARD

A Bargain

All new, surplus government stock. Complete with slings as shown.

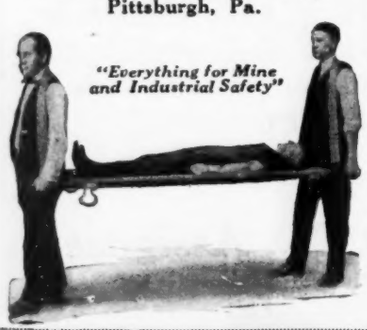
50% less than list price—lower than pre-war cost; lower we believe than they have ever been before offered. These 8,000 Stretchers are the last lot obtainable anywhere this season—this offer marks your last chance to take advantage of these prices.

1	Stretcher	$9.50 each
12	"	8.00 each
25	"	7.00 each
50	"	6.50 each
100	"	6.00 each

(Above prices f.o.b Pittsburgh)

MINE SAFETY APPLIANCES CO.

Chamber of Commerce Bldg.
Pittsburgh, Pa.



WE BUY—REBUILD—SELL OR RENT

All the Equipment Listed Below is Owned and Guaranteed by us and may be Inspected in one of Our Own Warehouses

DERRICKS

3—Shannon stiff leg Derricks, boom 14 x 14 x 75 ft., mast 12 x 12 x 38 ft., bucket handling.
3—Terry & Tench stiff leg Derricks, boom 14 x 14 x 60 ft., mast 12 x 12 x 32 ft. bucket handling.
2—Lambert stiff leg—boom 12 x 12 x 50 ft., bucket handling.
1—Shannon Guy Derrick, 14 x 14 x 80 ft. mast, 14 x 14 x 75 ft. boom, bucket handling.
1—Lambert Traveling Derrick, with 50 ft. boom, bucket operating track gauge 16 ft. with National 7¾ x 10 D.C. 3 drum hoist with boiler complete outfit.
2—All steel stiff leg, mast 40 ft., boom 65 ft., capacity 10 tons.
1—Brand New American Stiff Leg Derrick, boom 12 x 12 x 50 ft., bucket operating.
1—All Steel Guy Derrick, mast 90 ft., boom 81 ft., with guys, bucket operating, capacity 10 tons.
1—Dobbie Guy Derrick—16 in. x 16 in. x 80 ft. mast, 16 in. x 16 in. x 72 ft. boom.

HOISTS

1—10 x 12 D.C. 3 Drum Lidgerwood with Boiler.
2—9 x 10 D.C., D.D. with Boilers, 1 Lambert and 1 Lidgerwood with 4 independent clutch winch heads.
1—9 x 12 D.C. 3 Drum National with boiler.
2—9 x 10 D.C. 3 Drum with boiler: 1 Mead Morrison, 1 Brand new Clyde.
1—8½ x 10 D.C. Single Drum Lambert Skeleton.
1—8½ x 10 D.C. 3 Drum Lambert Skeleton.
1—8¼ x 10 D.C. 3 Drum Monighan with boiler.
3—8¼ x 10 D.C., D.D. Reversible Link Motion with boiler; one Lambert; two Lidgerwood.
3—7½ x 12 D.C., D.D. Skeleton Hoists, Mundy.
3—7 x 10 D.C. 3 Drum Hoists with Boilers: one American; one Mundy; one National.
19—7 x 10 D.C. D.D. with boiler; 1 American; 4 Lambert; 8 Lidgerwood; 1 C. & S.; 1 National; 1 Flory; 1 Mundy; 2 Crooke.
4—7 x 10 D.C. D.D. Skeleton Hoists; 1 Lidgerwood; 2 Mundy; 1 National.

Equipment Corporation of America

Philadelphia
675 Land Title Bldg.
Phone, Spruce 5498

Chicago, Ill.
1475 Lumber Exchange Bldg.
Phone Randolph 6586

Pittsburgh
875 Empire Bldg.
Phone Court 2424

ELECTRICAL REPAIRS

The most modern and best equipped repair department within 200 miles of Cincinnati. Call on us for prompt service.

Large stock of new and rebuilt motors.

WILLEY-WRAY ELECTRIC CO.
118 West 3rd St., Cincinnati, O.

CRESCENT

REPLACEMENT

ARMATURE COILS

for any type of motor shipment made in 24 hours—if desired.

Special Facilities
for
Prompt and Careful Service
for
Coal Mine and General Electric Repairs.

THE CRESCENT ELECTRIC & MFG. CO.
2515 Penn Ave., Pittsburgh, Pa.
Grant 3620 'Phones Main 2378

WANTED

MINING MACHINES

8—Goodman breast, preferably type 119 or 1906.
2—Sullivan CE 6.

MADISON COAL CORPORATION
Purchasing Department
908 S. Michigan Ave., Chicago, Ill.

SEARCHLIGHT SERVICE SECURES SATISFACTORY SITUATIONS

2003

SOME ONE WANTS TO BUY

the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

SELL IT BEFORE DEPRECIATION SCRAPS IT

THE SEARCHLIGHT SECTION IS HELPING OTHERS
—LET IT HELP YOU ALSO

0079

STOCK SHIPMENT

ALTERNATING CURRENT MOTORS

3-ph. 60-cy.—40° Rating

No.	Hp.	Rpm.	Volts	Type	Make
10	5	1200	220/440	AN	Allis-Chal.
4	5	1200	220/440	M	Cleveland
1	5	1200	220/440		Gen. Elec.
4	7½	1800	220/440	A	Ideal
2	7½	1800	220/440		F.-M.
2	7½	1200	220/440	A	Ideal
2	10	1800	220/440	AN	Allis-Chal.
4	10	1800	220/440	A	Ideal
3	10	1200	220/440	M	Cleveland
6	10	1200	220/440	A	Ideal
2	15	1800	220/440	AN	Allis-Chal.
5	15	1200	220/440	AN	Allis-Chal.
3	15	900	220/440	A	Ideal
1	20	1800	220/440		F.-M.
1	20	1200	220/440	A	Ideal
7	20	1200	220/440	AN	Allis-Chal.
1	25	900	220/440	BP	Wagner
2	30	1800	220/440	HF	Westinghouse
4	30	1200	220/440	CCL	Westinghouse
1	30	1200	220/440		Gen. Elec.
7	30	1200	220/440	AN	Allis-Chal.
1	35	1800	220/440	I Form K	Gen. Elec.
1	40	1800	2200	CS	Westinghouse
1	40	1200	220/440	CS	Westinghouse
2	40	900	220/440	AN	Allis-Chal.
6	50	1200	220/440	AN	Allis-Chal.
1	50	1200	220/440	BW	Wagner
1	50	900	220/440	CS	Westinghouse
2	50	900	220/440	AN	Allis-Chal.
1	50	900	220/440		Howell
3	75	900	220/440	AN	Allis-Chal.
1	75	720	220/440	AN	Allis-Chal.
3	100	900	220/440	AN	Allis-Chal.
3	100	720	220/440	AN	Allis-Chal.
1	100	1800	220/440		Gen. Elec.
1	150	1200	2200		Gen. Elec.
1	150	900	220/440	CS	Westinghouse
1	150	720	220/440	CS	Westinghouse
1	150	575	220/440		West. Elec.
1	200	720	220/440	AN	Allis-Chal.
1	200	580	220/440	CS	Westinghouse
1	250	514	220/440		Westinghouse
4	300	600	2200		Westinghouse
1	350	720	2200		Gen. Elec.
1	400	514	220/440	ANY	Allis-Chal.
2	400	450	550	CW	Westinghouse
1	600	600	550		Gen. Elec.
1	750	514	2200		Allis-Chal.

DIRECT CURRENT MOTORS

250 Volts

No.	Hp.	Rpm.	Wdg.	Type	Make
1	5	1200	Sh.	MP	Holtzer-Cabot
1	5	1650	Sh.	CE	Gen. Elec.
1	5	1850	...	CM	Cr.-Wheeler
3	7½	825	Sh.	CVC	Gen. Elec.
3	7½	1150	Cp.	SK	Westinghouse
1	7½	1150	Sh.	RC	Gen. Elec.
1	10	635	Cp.	MP	Gen. Elec.
1	10	1700	Sh.	RC	Gen. Elec.
1	13	1750	Sh.	SL	C & C
1	15	750	Sh.	CVC	Gen. Elec.
1	15	1170	Sh.	MC	Gen. Elec
1	20	650	Sh.		Milwaukee
1	20	1150	Sh.	RC	Gen. Elec.
1	35	720	Cp.		Lincoln
1	40	620	Cp.	S	Westinghouse
1	45	800	Sh.		Imperial
1	45	600/1200	Sh.		Northern
1	50	400/1200	Cp.		Westinghouse
2	50	560	Cp.	CL	Gen. Elec.
1	60	800	Cp.	MP	Gen. Elec.
1	75	680	Cp.	M	Westinghouse
1	80	800	Sh.		Gen. Elec.
1	90	1000	Cp.	A-50	Milwaukee
1	175	525/625			West. Elec.
1	300	500	Cp.		Thompson-Ry.

DIRECT CURRENT MOTORS

500/550 Volts

No.	Hp.	Rpm.	Wdg.	Type	Make
1	5	1525	Sh.		Peerless
1	7½	800	Sh.		Keystone
1	20	750	Sh.		Gen. Elec.
1	20	1125	Sh.		Gen. Elec.
1	35	565	Sh.	CL	Gen. Elec.
1	45	875	Cp.	MP	Burke
1	50	550/1100	Sh.	CLC	Gen. Elec.
1	185	430	Sh.	CLC	Gen. Elec.
1	200	550	Sh.	M	Westinghouse
1	265	510	Cp.	MP	Westinghouse

DIRECT CURRENT GENERATORS

250 Volts

No.	Kw.	Rpm.	Wdg.	Type	Make
1	15	1325	Sh.	RC	Gen. Elec.
1	25	850	Cp.	MP	Lincoln
1	30	725	Cp.	S	Westinghouse
2	38	650	Cp.	CL	Gen. Elec.
1	45	920	Cp.	MP	Gen. Elec.
1	56	800	Cp.	M	Westinghouse
1	60	920	Sh.	DLC	Gen. Elec.
1	65	860	Cp.	M	Westinghouse
1	70	1150	Cp.	A-50	Milwaukee
1	100	650	Cp.		Thompson-Ry.
1	150	550	Cp.		Morgan-Gard.
1	200	500	Cp.		Northern
1	225	575	Cp.		Thompson-Ry.
1	200	510	Cp.	M	Westinghouse

MOTOR GENERATOR SETS

1—25-kw., 250-volt, 860-r.p.m., cp.wd. Lincoln, D.C. Generator, direct connected to 1—new Allis-Chalmers induction motor, 220 or 440-volt, 860-r.p.m., 3-phase, 60-cycle complete.

1—40-kw., 250-volt, 860-r.p.m., cp.wd. Type MP General Electric, D.C. Generator, direct connected to 1—220 or 440-volt, 3-phase, 60-cycle, 860-r.p.m., new Allis-Chalmers induction motor, complete.

1—45-kw., 500-volt, 900-r.p.m., cp.wd., General Electric, D.C. Generator, direct connected to 1—220 or 440-volt, 900-r.p.m., 3-ph., 60-cy., new Allis-Chalmers induction motor, complete with switchboard.

1—65-kw., 250-volt, 860-r.p.m., cp.wd., Type M Westinghouse Generator, direct connected to 1—220 or 440-volt, 860-r.p.m., 3-ph., 60-cy. new Allis-Chalmers induction motor, complete.

1—65-kw., 250/275-volt, 900-r.p.m., cp.wd. Westinghouse, D.C. Generator, direct connected to and mounted on channel iron base with 1—125-hp., 2200-volt, 900-r.p.m., 3-ph., 60-cy. Allis-Chalmers synchronous motor, complete with switchboard.

1—70-kw., 250-volt, 860-r.p.m., cp.wd. General Electric Generator, direct connected and mounted on common bed plate with 1—220 or 440-volt, 3-ph., 60-cy., new Allis-Chalmers induction motor, complete with switchboard.

1—76-kw., 125/250-volt, 3-wire Western Electric Motor Generator Set, consisting of 2—38-kw., 125-volt Western Electric, D.C. generators, mounted on common shaft and belted to 1—new Allis-Chalmers, 220 or 440-volt, 3-phase, 60-cy. induction motor, complete with switchboard.

1—100-kw., 250-volt, 690-r.p.m., cp.wd. Thompson Ryan, D.C. Generator, direct connected to 1—Westinghouse, 220 or 440-volt, 690-r.p.m., 3-ph., 60-cy., induction motor, complete with switchboard.

1—150-kw., 125/250-volt, 1200-r.p.m., cp.wd. Westinghouse rotary Converter, with transformers, for 2200-volt, high tension, 3-ph., 60-cy., 187-volt low tension, starting taps complete with starting equipment and switchboard.

1—150-kw., 125/250-volt, D.C., 3-wire Burke Electric Motor Generator Set, consisting of 2—75-kw., 125-volt, cp.wd. Burke Generators, belted or chain driven by 1—new, 2200-volt or 440-volt, 3-ph., 60-cy. Allis-Chalmers motor, complete.

1—200-kw., 250-volt, 580-r.p.m., cp.wd. Westinghouse, D.C. Generator, direct connected and mounted on common base to 1—Westinghouse, 2200-volt, 3-ph., 60-cy. induction motor, complete.

1—200-kw., 250/275-volt, 900-r.p.m., cp.wd Ridgway, D.C. Generator, direct connected and mounted on common base with 1—2200-volt, 3-ph., 60-cy. Ridgway synchronous motor, complete.

1—200-kw., 500/550-volt, 580-r.p.m., cp.wd., Westinghouse, D.C. Generator, direct connected to and mounted on common base with 1—2200-volt, 3-ph., 60-cy., type CCL Westinghouse, induction motor, complete with starter and D.C. panel.

DIRECT CURRENT ENGINE GENERATOR SETS

250 Volts

1—30-kw., 250-volt, 800-r.p.m., cp.wd., Type S Westinghouse, D.C. Generator, belted to 1—Ball, single cylinder horizontal steam engine, 100 lb. steam pressure, 200-r.p.m., complete with belt, pulleys, field rheostat and switchboard panel. Very good condition.

1—35-kw., 250-volt, 900-r.p.m., Imperial, D.C. Generator, belted to

1—Atlas Horizontal, single cylinder, center crank, 4-valve steam Engine, 11½ x 14, 100 lb. steam pressure, complete with belt pulleys, field rheostat and switchboard panel.

1—65-kw., 860-r.p.m., cp.wd., Type M Westinghouse, D.C. Generator, belted to 1—Ball horizontal, single cylinder, slide valve Steam Engine, 12 x 12, 100 lb. steam pressure, 250 r.p.m., complete with belt pulleys, field rheostat generator switchboard and all accessories.

1—70-kw., 250-volt, 1100-r.p.m., cp.wd., Milwaukee, D.C. Generator, belted to 1—Lord Howler 125-hp. steam engine, complete with belt pulleys, rheostat and switchboard panel.

1—75-kw., 250-volt, 285-r.p.m., cp.wd. Western Electric, D.C. Generator, belted to 1—Lord Howler horizontal, single cylinder, slide valve steam engine, 125-hp., 220-r.p.m., 100 to 125 lb. steam pressure, complete with all accessories, including switchboard.

1—100-kw., 250-volt, 250-r.p.m., cp.wd., Type MP, General Electric, D.C. Generator, direct connected and mounted on common bedplate with 1—Erie horizontal, single cylinder, side crank, slide valve steam engine, 200-hp., 100-lb. steam pressure, 17-in. bore, 16-in. stroke, complete with all accessories, including switchboard.

1—125-kw., 250-volt, 250-r.p.m., cp.wd. Ridgway D.C. Generator, direct connected and mounted on common bedplate with 1—Ridgway horizontal, single cylinder, side crank, slide valve steam engine, 225-hp., 16-in. bore, 18-in. stroke 100 lb. steam pressure, complete with all accessories, including switchboard.

1—110-kw., 250-volt, 250-r.p.m., cp.wd. Ridgway, D.C. Generator, mounted on common bed plate, direct connected to 1—Ridgway horizontal single cylinder, side crank, slide valve steam engine, 175-hp., 250-r.p.m., 100 lb. steam pressure, complete with all accessories.

1—125-kw., 275-volt, 510-r.p.m., cp.wd. Westinghouse Generator, belted to Hamilton Corliss horizontal, single cylinder, 4-valve steam engine, 12 x 36, 100 lb. steam pressure, 100-r.p.m. complete with switchboard belt and all accessories.

1—150-kw., 250-volt, 275-r.p.m., cp.wd. Burke D.C. Generator, mounted on bed plate with and coupled to 1—Fleming Harrisburg, horizontal, single cylinder, 2-valve steam engine, 200-r.p.m., 125-lb. steam pressure, complete with all accessories.

1—150-kw., 250-volt, 200-r.p.m. cp.wd. Thompson Ryan, D.C. Generator, direct connected and mounted on common bed plate with 1—McEwen single cylinder center crank, slide valve steam engine, 238-hp., 18 x 19, complete with all accessories.

MINING MACHINES

2—27-A Jeffrey, 250-volt, D.C., low vein coal cutters, 36-in. gage, 5-ft. cutter bar.

2—CE-7 Sullivan iron clad shortwall Coal Cutters, almost new, 220-volt, 3-ph., 60-cy., 44-in. gage, 7½-ft. cutter bar.

2—CE-8a Sullivan,220-volt, A.C.,3-ph., 60-cy., 36-in. gage, 7½-ft. cutter bar, shortwall mining machines.

1—28-A Jeffrey, 250-volt, D.C., 44-in. gage shortwall Mining Machines.

1—Morgan-Gardner, Type SA shortwall Mining Machine, 250-volt, D.C., 42-in. gage, 6-ft. cutter bar.

MINING LOCOMOTIVES

1—4½-ton, 250-volt, D.C., 36-in. gage, brand new Baldwin Westinghouse bar steel, type trolley haulage locomotive, complete. Immediat shipment.

1—6-ton Baldwin-Westinghouse, bar steel type trolley haulage locomotive, 250-volt, D.C., 36-in. gage, excellent condition.

1—8-ton, Jeffrey, 250-volt, D.C., 36-in. gage, haulage locomotive, complete with trolley.

1—10-ton Goodman, Type 8M 10-A trolley type Haulage Locomotive, 250-volt, D.C., 36-in. gage.

1—13-ton Morgan-Gardner trolley type haulage Locomotive, 250-volt, D.C., 44-in. gage.

Office and Factory:
PITTSBURGH PA.

DUQUESNE
New and used Electrical Equipment
Electric & Mfg. Co.

WRITE, WIRE OR TELEPHONE
Cable Address:
"DEMCO"

Mine Fans

60 in. Sirocco Double Blower, direct connected to 75 hp. DeLaval Steam Turbine, capacity 16,000 cu. ft. against 20 in. pressure.

100 in. American Steel Plate Blower driven by two 6 x 6 Engines.

90 in. Sturtevant Steel Plate Exhauster with 5 x 5 Engine.

87 in. Sturtevant Steel Plate Exhauster with 7½ hp. 220 V. D.C. Motor.

78 in. Sturtevant Blower.

66 in. Buffalo Blower.

66 in. Steel Plate Blower.

2—60 in. Hess Steel Plate Blowers.

54 in. Green Steel Plate Exhauster, direct connected to 3 in. x 2½ in. Vertical Engine.

48 in. Garden City Double Steel Plate Blower or Exhauster.

48 in. Garden City Double Steel Plate Blower or Exhauster.

35 in. Buffalo Blower.

30 in. No. 3 Sturtevant Pressure Blower, bronze impellor.

30 in. No. 3 Sturtevant Pressure Blower.

Steam Blower for Forced Draft.
No. 5 Buffalo Blower.

MINE PUMPS FOR STEAM OR MOTOR DRIVE. AIR COMPRESSORS, HOISTS, BOILERS, ELECTRICAL MACHINERY.

WICKES MACHINERY CO.
Jersey City, N. J.

FOR SALE

Engine Generator Sets

Big Bargains—Instant Shipments

1— 100 kw., 250 Volt, 270 r.p.m., 400 Amp., Type MP, Compound Wound, General Electric Generator, direct connected to a 16 x 14 Horizontal Center Crank Automatic Erie City Engine.

Price f.o.b. Cars, Pittsburgh, Pa.....$2000.

1—150 kw., 275 Volt, 200 r.p.m., Heavily Compounded Westinghouse Generator, direct connected to a 19 x 20 Horizontal Side Crank Right Hand Slide Valve Automatic Ridgeway Engine; complete with Throttle Valve, Lubricator and Single Panel Switchboard.

Price f.o.b. Cars, Wilkes-Barre, Pa.....$4000.

1—200 kw., 250/275 V., 100 r.p.m., 800 Amp. 8 Pole, Compound Wound, direct current National Generator direct connected to a 16 x 42 Horizontal Side Crank Heavy Duty, Rolling Mill Type Quincy Corliss Engine. Outfit complete with accessories and Switchboard having all necessary instruments for control.

Price f.o.b. Cars, Rockford, Ill.....$5000.

2—250 kw., 175 r.p.m., 275 Volt, Compound Wound, 910 Amp. Ridgeway Generators direct connected to a 22 x 24—384 hp. Horizontal Side Crank, Right Hand, Simple Slide Valve Ridgeway Engines. Each Unit Complete with Switchgoard. These two Outfits Practically New. Can be seen in operation if inspected quickly.

Price f.o.b. Cars, near Pittsburgh, Pa.....Each $7500.

All of these outfits are in practically new condition. They can be reinstalled and put into immediate operation without repairs—the commutators are full, insulation all in perfect condition, bearings fine, and cylinders all true and smooth.

These outfits must be sold quickly. Your inspection invited—it will show that units are decided bargains.

If interested, use the wires, our expense.

WOOD & LANE COMPANY, St. Louis

STEAM SHOVEL

Bucyrus 14-B No. 3376, full revolving, ¾-yd. dipper, mounted on caterpillar traction. Standard equipment, A.S.M.E. boiler; new Spring of 1920. Used very little.

READING ENGINEERING CO., Inc.
Tribune Bldg., New York City

IDEAL ENGINE $650.00

150 hp. Ideal Automatic Engine, Tandem Compound, 12 x 20 x 14 Centre Crank, 240 r.p.m., wheel 60 x 14 on cast iron subbase, with throttle valve. A fine engine at a sacrofice.

75 kw. Gen. Elect. 250 volt Generator, almost new, with modern panel, pulley and rails, $1,200.

ROSE ELECTRIC COMPANY
6431 State St., Chicago, Ill.

MARINE BOILER

200 hp. High Pressure Scotch Marine Boiler. Price to sell.

DECKARD STEEL & IRON CO.
Fifth and Smelter Ave., Pittsburgh, Kansas

FOR SALE THE FOLLOWING USED AND REBUILT

MINING MACHINES

2—500 volt CE-6 Sullivan Shortwall.
3—250 volt CE-6 Sullivan Shortwall.
3—250 volt CE-7 Sullivan Shortwall.
2—Morgan-Gardner CE-7.
1—28-A Jeffrey.
1—Pneumelectric Puncher.
1—500 volt, 27-B Jeffrey Breast Machine.
1—17-A Jeffrey Breast Machine, 250 volt.

NEW MATERIAL IN STOCK

Ventilating Fans—Mine Pumps. Room Hoists—Feed Chains for Sullivan Machines.

Cutter Bits and Set Screws for all Shortwall Machines. Machine Cable.

PITTSBURGH MINING MACHINERY CO.

Office:
813 1st National Bank Building
Pittsburgh, Penna.

Factory:
Cantril and Magnolia Sts.
N. S. Pittsburgh, Penna.

The Searchlight Advertising in This Paper

is read by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good second-hand piece of apparatus at a moderate price, or an expert employee.

THE BEST PROOF

of this is the variety of this journal's Searchlight ads. Without a constant and appreciable *demand* for such machinery or services, by its readers, the market place which these advertisements represent could not exist for any length of time.

Are *you* using the Searchlight Section?

Honestly-Rebuilt

ELECTRICAL MACHINERY

MOTOR DRIVEN PUMPS

8 x 10-in. Gould Vert. Triplex with 25-hp., 3-ph., 60-cy., 220-volt G. E. motor.
8-in. Worthington, Horiz. Split Case Centrifugal with motor to suit.
6-in. Lea-Courtney Horiz. Split Case Centrifugal with motor to suit.
6-in. Lawrence Centrifugal with motor to suit.
5-in. Lea-Courtney Horiz. Split Case Centrifugal with motor to suit.
5-in. Lea-Courtney Multi-Stage Horiz. Split Case Centrifugal with motor.

MOTOR DRIVEN HOISTS

12-hp., 250-volt, D.C. Sgle. Friction Drum Hoist-Drum 12-in. dia. 14-in. face.
30-hp., A.C. Ottumwa Sgle. Friction Drum Hoist-Drum 26-in. dia. 20-in. face.
75-hp., A.C. Ottumwa Sgle. Friction Drum Hoist-Drum 32-in. dia. 22-in. face.

ELECTRIC LOCOMOTIVES

3-ton, 250-v., D.C., Gen'l Elect., 28-in. ga.
4-ton, Storage Battery Westgh., 46-in. ga.
4½-ton Storage Battery G. E., 30-in. ga.
6-ton, 250-v., D.C., Gen'l Elect., 36-in. ga.
6-ton, 250-v. D.C., Gen'l Elect., 42-in. ga.
6½-ton, 500-v., D.C., Gen. Elec., 36-in. ga.
10-ton, 250-v., D.C., Westgh., 42-in. ga.
13-ton, 250-v., D.C., Westgh., 36-in. ga.
15-ton, 250-v., D.C., Westgh., 36-in. ga.

POWER PLANT EQUIPMENT

1,200-kw., 250-v., D.C., Crocker-Wheeler with Watts Campbell Engine.
500-kw., 250-v., D.C., Crocker Wheeler with Ironton Steam Engine.
2-250-kw., 250-v., D.C., Ridgway with 4-valve Ridgway Engines.
150-kw., 250-v., D.C., Westinghouse with Ball Engine.
110-kw., 250-v., D.C., Gen'l Elect. with Ball Engine.
75-kw., 250-v., D.C., Westinghouse with Harrisburg Engine.

MOTOR GENERATOR SETS

500-kw., 500-v., D. C., Gen'l Elect., 3-ph., 60-cy., Synchronous Set.
500-kw., 250-v., D. C., Gen'l Elect., 3-ph., 60-cy., Synchronous set.
250-kw., 250-v., D. C., Allis Chalmers, 3-ph., 25-cy., Synchronous Set.
200-kw., 250-v., D. C., Westinghouse, 3-ph., 60-cy., Synchronous Set.
200-kw., 500-v., D.C., Allis Chalmers, 3-ph., 60-cy., Synchronous Set.
150-kw., 500-v., D. C., Westinghouse, 3-ph., 60-cy., Induction Set.
2—100-kw., 275-v., D.C., Gen'l Elect., 3-ph., 60-cy., Rotary Converters.

WE SOLICIT INQUIRIES FOR
MOTORS AND POWER PLANT APPARATUS

MILLER-OWEN ELECTRIC CO.
(Incorporated)
PGH'S ELECTRICAL CLEARING HOUSE
Established 1908
PITTSBURGH, PA

A
"Searchlight"
Ad
Costs Little
and is
Quick Acting

0231

POWER MACHINERY EXCHANGE

INCORPORATED

1 Montgomery Street, Jersey City, N. J.

SPECIALS

A. C. Direct Connected Units

375 kva. G.E., 3 ph., 60 cy., 2300 v. alternator with Curtis horizontal turbine with dir. con. exciter, switchboard and condenser (seen operating), immediate delivery.

250 kva., Al.-Chal., 3 ph., 60 cy., 2300 v. (or 440-220 v.) with Hamilton heavy duty engine, 200 rpm.

250 kva. Al.-Chal., 3 ph., 60 cy., 440-220 v., with Buckeye 18 x 30 heavy duty engine, 120 rpm.

175 kw. Al.-Chal., 2 or 3 ph., 60 cy., 2300 v. (or 440-220 v.), with Al.-Chal. 16 x 30 heavy duty Corliss engine, 150 rpm.

100 kw. Al.-Chal., 3 ph., 60 cy., 2300 v. (or 440-220 v.) with Erie Ball, side crank, 12 x 14 engine.

100 kva. C.-W., 2 or 3 ph., 60 cy., 2300 v. (440-220 v.) with Erie Ball, side crank, 12 x 14 engine.

100 kva. C.-W. 2 or 3 ph., 60 cy., 2300 v. (440-220 v.) with Ridgway 14 x 12

90 kva. G.E., 3 ph., 60 cy., 2300 v. (or 440-220 v.) with Chuse Uniflow engine, 14 x 16, side crank (seen operating).

75 kva. G.E., 3 ph., 60 cy., 2300 v. (or 440-220 v.) with Harrisburg 13 x 14 side crank engine.

60 kva. Elec. Mchy., 3 ph., 60 cy., 2300 v. (or 440-220 v.) with Skinner 11 x 12 engine.

Direct Current Units

300 kw. C.-W., 250 volt, 12 pole, with Watts Campbell cross comp. engine (seen operating).

200 kw. Wghse. 250 volt, 8 pole, with Erie Ball engine.

300 kw., 250 kw., and 200 kw. G.E., 125 volt generators with Fleming, 4 valve engines.

100 kw. Wghse., 125 volt, 8 pole, with Skinner 15 x 16 engine.

75 kw., 60 kw., 50 kw., 40 kw., 30 kw., 25 kw., 20 kw., 15 kw., 10 kw., 7 kw.,

---

Switchboards

D.C.—Stock Shipment
A.C.—Prompt Shipment

All Sizes
Built to Specifications

DUQUESNE ELECTRIC & MANUFACTURING CO.
PITTSBURGH, PA.

PIPE

30,000 ft.	1 in.
10,000 ft.	1¼ in.
8000 ft.	1½ in.
70,000 ft.	2 in.
3000 ft.	2½ in.
12,000 ft.	3 in.
70,000 ft.	4 in.
100,000 ft.	6 in.

Completely overhauled with new threads and couplings.

JOS. GREENSPON'S SONS IRON & STEEL CO.
St. Louis, Mo.

Vulcan Hoisting Engine For Sale

26 in. x 48 in. First Motion Link Reversing with two conical drums, 9 ft. to 12 in.; coils 700 ft. of 1½ in. wire rope. New, never having been installed. For complete specifications, write

Wm. Ward Machinery Co.
1101 Standard Life Bldg., Pittsburgh, Pa.

FOR SALE

Complete Outfit of Machinery

for the manufacture of briquettes.

F.S. 815—Coal Age
10th Ave., at 36th St., New York City

FOR SALE

75—150—200 and 400 kw., 250—275 v. Eng. Sets.
3—150 hp. buttstrap H.R.T. boilers, 75 hp. 440 v., 3 ph., Flory Hoist.
Cent. and Steam Pumps—Used Machy.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

SEND FOR NEW LIST

of New and Used
Mine, Mill and Contractors' Equipment

MINING EQUIPMENT & SUPPLY CO.
Wilkes-Barre, Pa.

---

100 K.W. SYNCHRONOUS M.-G. SET

1—100 Kw. 250/275 V. 900 rev., Type D.L.C., **General Electric Generator** with interpoles direct connected to 1—150 Hp., 2300 volt, 3 phase, 60 cy. G. E. synchronous motor with direct connected exciter. With brand new starting panel and generator panel.

6-Ton JEFFREY LOCOMOTIVE

1—6 ton, 36 in. gauge, two-motor type **Locomotive** with extra armature.

DIRECT CONNECTED ENGINE GENERATOR SETS

1—200 Kw., 250 volt Westinghouse 20 x 21 **Erie City**, with switchboard.
1—150 Kw., 250 volt G. E. 19 x 20 **Harrisburg**, with switchboard.
New A. C. MOTORS, 1 to 50 Hp.

Moorhead Machinery Co.
522 Pittsburgh Life Bldg., Pittsburgh, Pa.

AVAILABLE NOW!

For Immediate Delivery

New Water Tube Boilers

220-225-250-275-300 HP.
HEINE-COLVEN-FOSTER
and Other Standard Makes

Write for Boiler Bulletin

DUMP CARS

150—12-yd. Western & Oliver All-steel 2-way Dump Cars.
2—6-yd. Western 2-way Dump Cars.
50—1¼-yd. 20 in. gauge Wood Body 2-way Dump Cars.
10—Tipple Cars, 48 inch gauge, 16 inch diameter wheels, 3½ inch flange, fitted on 2¼ inch square axles, size of car is 7 ft. 9 in. long, 6 ft. wide and 20 in. deep in the center, made by Kilbourne and Jacobs Co.
30—Sets of 36 in. gauge car trucks, each set of trucks equipped with four 26 in. diameter solid wheels, mounted on about 3½ in. axles. Write for further particulars.

MACHINERY

7—Westinghouse, 250 hp. Motors, Type C.C.L. 440 volt, 60 cycle, 3 phase motors. Speed 514 r.p.m. with base and starters. Can be furnished with pulley or Flange Coupling.
1—250 K.V.A. General Elec. 220 volt, 3 phase, 60 cycle, Generator Direct Connected to an Automatic Steam Engine.
4—7½ in. x 10 in. double cylinder single geared Drum Hoisting Engine with reversing throttle valves.
1—3 Ton American 4 wheel locomotive crane standard gauge, 24 ft. boom.
1—60 Hp. Locomotive Firebox Boiler, 100 lb. pressure.

Write for Machinery List No. 308

HARRIS BROTHERS COMPANY
35th and Iron Sts., Chicago

MOTORS—60 cycle, 2 and 3 phase

2200 VOLTS	1— 50 hp., Westinghouse, type CCL,	690 r.p.m.
550 VOLTS.	1—250 hp., Allis-Chalmers,	440 r.p.m. Slip ring.

220/440 VOLTS

1—200 hp., Westinghouse, type C,	580 r.p.m.
1—200 hp., Crocker-Wheeler,	870 r.p.m.
3—100 hp., Crocker-Wheeler,	1800 r.p.m.
1—100 hp., Crocker-Wheeler,	850 r.p.m.
2—100 hp., Crocker-Wheeler,	720 r.p.m. Slip ring.
1— 75 hp., Westinghouse, type CCL,	850 r.p.m.
1— 75 hp., Westinghouse, type CCL,	1120 r.p.m.
1— 75 hp., Crocker-Wheeler,	1160 r.p.m.
1— 50 hp., General Electric, type I,	600 r.p.m.
1— 50 hp., Crocker-Wheeler,	720 r.p.m.
1— 50 hp., Fairbanks-Morse,	720 r.p.m.
1— 50 hp., Fairbanks-Morse,	1200 r.p.m. Slip ring.
1— 40 hp., Crocker-Wheeler,	865 r.p.m.

NEW SINGLE-PHASE CENTURY, 110-220 VOLTS
Prices f.o.b. Pittsburgh

3—3 hp., 1165 r.p.m., $238 each. 2—1½ hp., 1750 r.p.m., $135 each.
5—1½ hp., 1165 r.p.m., $157 each. 5—1 hp., 1165 r.p.m., $135 each.
2— ¾ hp., 1165 r.p.m., $114 each.

Also a stock of various smaller sizes in A.C. and 110, 220 and 500 volts D.C.
Motor-generators—Turbo-generator units—Direct connected units—Gas Engines —Boiler—Complete Plants—Ice Machines.

W. A. CARRELL CO., 211-213-215 Second Ave., Pittsburgh, Pa.

POWER!

1—208 H.P. B. & W. type Boiler, 160 lb. pressure.
2—Portable Boilers, Economic type, 60 and 100 H.P. each, complete with stacks and fittings.
8—Feedwater Heaters, 50 to 2500 H.P.
1—150 K.V.A. Alternator, used two months.
2—150 K.V.A. Semi-Diesel Oil Engine Units, direct connected.
14—265 K.W. General Elec. Transformers.
8—D.C. 250 Volt Units, various sizes.

Engine Generator Units
Large Stock Belted Corliss Engines.
Complete Power Plants Designed and Erected.

Your inquiries solicited.

POWER EQUIPMENT CO.

Engrs.
1809 Buttonwood St., Philadelphia, Pa.

MINING MACHINES

5—28A Jeffrey Shortwall, any gauge.
3—CE6 Sullivan Shortwall, 42-in. gauge.
6—CE7 Sullivan Shortwall, any gauge.
2—Jeffrey Arcwall, 44-in. gauge.
2—HD Morgan Gardner Breast, any gauge.
2—1906 Goodman Breast, any gauge.
2—17A Jeffrey Breast, 42-in. gauge.
1—5-ton, 44-in. gauge, and 2—4½-ton, 36-in. gauge Ironton Storage Battery Motors.
1—5-ton Goodman, 44-in. gauge.
2—3½-ton Jeffrey Gathering Motors, 42-in. gauge.
2—8-ton old type Goodman Single Armature Locomotives, 42-in. gauge.
Rails, new and relayers, Generators, Engines, Boilers, and all classes of mine equipment.

H. T. LAMBERT CO.

Huntington, West Virginia

HOISTS AND HAULAGES

Electrics

3—New Single Friction Drum, will hold 8000 ft. or less dependent on enlargement of drum diameter; 42-in flanges 48-in. width; extra braking power if wanted.
2—single or one double tandem or twin drum, 24 x 36-in. for 50 hp.
1—18 x 30-in. drum, double brakes, 40 to 50 hp.
1—18 x 24-in.; 38-in. Brake. Triple geared, suitable for small shaft, for car mover, etc.
Several Hoists with drums 14 x 18-in.; 12 x 16-in. and smaller.

STEAM HAULS

9 x 10-in. reversing, double friction drums, 34-in.
7 x 10-in. three friction drums for derrick.
7 x 10-in. double drum, with or without boiler.
6 x 8-in. single drum steam reverse.

GRAVITY SPOOL DRUMS

Self contained, iron and steel construction; very good where conditions suit; you know yours; give weight cars, coal, grade, length and speed. Four in stock.

FANS—For Engine or Motor

7½-ft. and 7-ft. 54-in. wheels, steam, Sturtevant.
4-ft. American disc—others.

STEAM PUMPS, BOILERS, ENGINES

Grab buckets; half and three-quarter yard.

John H. Carlin Machine Co.

Sandusky-Lacock Sts., Pittsburgh, Pa.
Bell Phones: 6460-6461 Cedar.

FOR SALE

1—380 hp. hand-fired Stirling Water Tube

BOILER

334—tubes, 3¾-in. dia., guaranteed for 100 lb. steam pressure, complete with all fittings. Excellent condition.

Duquesne Electric & Mfg. Co.
Pittsburgh, Pa.

FOR SALE

2—100 kw., 250 volt, 400 amp., 250 r.p.m. compound wound, type CCD Crocker-Wheeler direct connected

GENERATORS

Each direct connected 14 x 15 Erico automatic engine. Complete with switchboard panels and instruments; first class condition.
Special bargain for immediate disposition.

The National Power Machinery Co.
1914-1918 Scranton Road,
Cleveland, Ohio

THE CURTISS-WILLIS CO., Inc.

No. 30 Church St., New York

Send for our new tank list—most complete ever issued

Largest Dealers in

USED AND NEW TANKS

FOR SALE

Williams No. 1 regular

COAL CRUSHER

PENNSYLVANIA POWER & LIGHT CO.
802 Hamilton Street, Allentown, Penna.

Electric Mine Equipment

New and used always available. Write us your needs

PENN ELECTRICAL ENGINEERING CO.
Scranton, Pa.

FOR SALE

20—Boilers $300 to $1000.
5—Butt Strapped Boilers State Inspection of 112 lb. reset.
8—Boiler feed pumps
1—Double Hoisting 8 x 10
1—12 x 34 first motion hoist.
20—Set shaker grates.
100 ft. 60 in. stack.

A. D. TORR
17 S. 6th St., Terre Haute, Ind.

ON HAND

Hoisting Engines, Concrete Mixer, Boilers, Pumps and General Mining Equipment

Empire Engineering & Equipment Company,
Empire Building, Pittsburgh, Pa.

NEW MOTOR GENERATOR SET

Prompt Delivery

1—New 100 k.w. Westinghouse, 250 volt, 900 r.p.m. compound wound D.C. Generator, mounted on common base with and direct connected to a new 100 k.v.a. Westinghouse 3-phase, 60-cycle, 2300 volt, 900 r.p.m. synchronous motor with direct connected 3 k.w. exciter and complete control panel and instruments.

ALSO POWER PLANT MACHINERY

Engines, Boilers, Motors and Generators

Our Shops and Experience are at Your Service

THE RANDLE MACHINERY CO.

1831 Powers St. ***(Established 35 Years)*** **Cincinnati, Ohio**

MAC GOVERN & COMPANY — POWER MACHINERY

114 Liberty St., New York, N. Y.

25 and 60 Cycle Rotary Converters

Prompt Shipment from Stock

1—1500 kw. Westinghouse Rotary Converter, 6 phase, 250 volts D.C., 178 volts A.C., 450 r.p.m., speed limit device on end of shaft, with switchboard complete with all necessary instruments.

1—1000 kw. Westinghouse Rotary Converter, 6 phase, 220 volts D.C., 156 volts A.C., 514 r.p.m., with switchboard and all necessary instruments.

1—1000 kw. Westinghouse Rotary Converter, 6 phase, 25 cycle, 270 volts D.C., 187½ r.p.m. with 3—400 kva. air cooled transformers, 6300/170 volts, also complete switchboard equipment.

1—400 kw. Westinghouse Rotary Converter, 2 phase, 60 cycle, 16 pole, 236/275 volts D.C., 450 r.p.m. with direct connected exciter, also 2—200 kw. Westinghouse OISC, single phase, transformers, 3464/167 and 3984/193 volts.

2—200 kw. Westinghouse Rotary Converters, 3 phase, 60 cycle, 8 pole, 250 volts D.C. 900 r.p.m. with direct connected exciter, with transformers and complete switchboard equipment.

The above are only a few items from our large stock of Steam and Electrical Equipment. Complete list will be gladly mailed upon request.

BRANCH OFFICES:
Pittsburgh, Pa.: 498 Union Arcade Bldg.
Seattle, Wash.: L. C. Smith Building
Montreal, Que.: 285 Beaver Hall Hill

ENGINE TYPE GENERATORS

1—250-kw., 275 volt, Crocker-Wheeler, Type CCD, direct current generator, direct connected to a 22 x 21 in. Buckeye Engine, with Vermont marble panel board, ammeter, main generator switch, circuit breaker and field rheostat, engine lubricator, throttle valve, drain valves and automatic oiling system.

1—200 kw., 275 volt, Crocker-Wheeler, Type CCD, direct current generator, direct connected to an 18¾ x 21 in. Buckeye Engine, with Vermont marble panel board, ammeter, main generator switch, circuit breaker and field rheostat, engine lubricator, throttle valve, drain valves and automatic oiling system.

ELLIOTT ELECTRIC CO.
Cleveland, Ohio

DIRECT CURRENT GENERATORS

STOCK SHIPMENT

1—60 kw. 220 volt 240 amp. 700 r.p.m. shunt Commercial generator complete.
1—75 kw. 220 volt 300 amp. 750 r.p.m. comp. Fairbanks-Morse generator complete.
1—80 kw. 220 volt 650 r.p.m. Milwaukee generator complete.
1—100 kw. 220 volt 400 amp. 255 r.p.m. 3 wire Western Elect. generator direct connected to Fitchburg tandem compound automatic engine 11 x 18 x 14.
1—125 kw. 220 volt 600 r.p.m. compound Ft. Wayne generator complete.
1—150 kw. 220 volt 255 r.p.m. Western Elect. generator direct connected to Fitchburg tandem compound automatic engine.
1—150 kw. 230 volt 450 r.p.m. comp. General Elect. generator complete.
1—200 kw. 250 volt 500 r.p.m. Northern generator complete.
1—400 kw. 220 volt 150 r.p.m. Western Elect. generator direct connected to Monarch tandem compound Corliss Engine.

INDEPENDENT ELECTRIC MACHINERY COMPANY
20th and Central Streets, Kansas City, Mo.

---

750 K. W. M. G. SET

1—New Westinghouse, 750 kw., D.C., 125/250 volt, direct connected to 1100 Hp., 2300 volt, 3 ph., 60 cycle, synchronous motor complete with switchboard

Motor Generator Sets assembled to spec. one to three weeks' delivery.

Variable Speed, D.C. Motors

6—50/100 Hp., new Reliance, 220 volt, 475/950 r.p.m.
8—25 Hp., new Reliance, 220 volt, 500/1500 r.p.m.

Constant Speed D.C. Motors

Following Prices Now Subject to 10% Discount

1	70 hp.,	125 volt,	650 r.p.m.	$1,150.00
1	50 hp.,	230 volt,	550 r.p.m.	1,100.00
1	50 hp.,	220 volt,	850 r.p.m.	850.00
1	40 hp.,	220 volt,	730 r.p.m.	850.00
1	35 hp.,	125 volt,	975 r.p.m.	625.00
1	35 hp.,	125 volt,	625 r.p.m.	825.00
1	20 hp.,	125 volt,	600 r.p.m.	600.00
1	20 hp.,	220 volt,	800 r.p.m.	435.00
1	15 hp.,	125 volt,	625 r.p.m.	435.00
1	15 hp.,	125 volt,	875 r.p.m.	400.00
1	15 hp.,	125 volt,	850 r.p.m.	400.00
1	15 hp.,	230 volt,	800 r.p.m.	425.00
1	15 hp.,	125 volt,	625 r.p.m.	435.00
1	15 hp.,	125 volt,	700 r.p.m.	415.00
1	15 hp.,	220 volt,	900 r.p.m.	385.00
1	10 hp.,	125 volt,	1,200 r.p.m.	300.00
1	10 hp.,	125 volt,	825 r.p.m.	325.00
2	10 hp.,	125 volt,	600 r.p.m.	430.00
1	10 hp.,	230 volt,	950 r.p.m.	315.00
1	10 hp.,	500 volt,	900 r.p.m.	315.00
1	10 hp.,	125 volt,	750 r.p.m.	325.00
1	10 hp.,	230 volt,	750 r.p.m.	325.00
1	10 hp.,	125 volt,	1,400 r.p.m.	280.00
1	10 hp.,	125 volt,	1,000 r.p.m.	290.00
1	7½ hp.,	230 volt,	1,150 r.p.m.	260.00
1	7½ hp.,	125 volt,	1,650 r.p.m.	200.00
1	7½ hp.,	500 volt,	850 r.p.m.	270.00

Smaller sizes in D.C. also 400 Hp. down in A.C. motors.

THE ELECTRIC MOTOR & REPAIR CO.
Akron, Ohio.

FOR SALE

STEAM DRIVEN GENERATOR SET

One—(1) 400 kw., 500 volt D.C. Crocker Wheeler Compound Wound Generator, driven by and direct connected to a 120 r.p.m. Bates tandem compound 18 in. x 30 in. x 36 in. Corliss Engine.

This Equipment is now in standby service and can be inspected in operation most any time. For the Engine, we will furnish all Appurtenances necessary for operation, including gauge board, steam gauges, receiver, receiver piping, throttle valve, etc. For the Generator we will furnish a pedestal equalized switch, breaker and rheostat, but no panel or instruments.

TENNESSEE COPPER COMPANY
61 Broadway, New Work

250-Volt D. C. Generators

	Kw.		Speed
1	15	Western Elec.	780
1	20	Sprague, DeLaval single-stage steam turbine	2000
1	25	Fairbanks-Morse	1050
2	62½	Allis-Chalmers	450
1	75	Morgan-Gardner	750
1	100	Allis-Chalmers	850
1	100	Gen. Elec., type CL	550
2	125	Allis-Chalmers	850
1	150	Ft. Wayne, interpole	650

America's headquarters for second-hand Electrical Machinery overhauled—"like new."

Send for our "Monthly Bargain Sheet," showing complete stock on hand, with net prices.

GREGORY ELECTRIC CO.
CHICAGO, ILLINOIS

For Immediate Shipment.
1—35 kw. D.C. 125 volt
NORTHERN GENERATOR
direct-connected to Buckeye engine. Switchboard. First Class Shape.
Also large stocks of Rails, Cars, Locomotives, Hoisting Engines, etc.

ZELNICKER IN ST. LOUIS

IMMEDIATE DELIVERY

Mine Locomotives

Westinghouse two-motor mine type locomotive, 500 volt operating current and in good operating condition.

All are operated with drum type controllers.

An opportunity to get a Mine Locomotive at practically your own price.

TENNESSEE COPPER CO.
61 Broadway, New York City

LOCOMOTIVES

6 x 10 Vulcan Locomotive, 42 in. gauge.
9 x 14 Davenport Locomotive, 42 in. gauge.
10 x 14 Vulcan Locomotive, 36 in. gauge.
10 x 16 Vulcan Locomotive, 36 in. gauge.
7 x 12 Davenport Locomotive, 36 in. gauge.

ENGINES

13 x 15 Skinner 150 hp. Automatic.
11 x 16 Rice 65 hp. Automatic.

TANKS

27 ft. diameter by 23 ft. high, 100,000 gallon water tank, ¼ in. steel. In first-class condition.

HOISTING ENGINES

7 x 10 D.C. S.D. Lidgerwood Engine.
9 x 12 D.C. S.D. Coal Hoisting Engine.
12 x 24 D.C. S.D. First Motion Coal Hoist.

All rebuilt in our shops.

The Pittsburg Boiler & Machine Co.
Pittsburg, Kans.

Mine Equipment

3—100 kw., 250 volt Generators, direct connected to steam engine. Complete Switchboards.
1—35B Jeffrey 250 volt mining machine.
1—13 Ton, 250 volt Baldwin Westinghouse Locomotive.

Other Machinery for any requirement. Send us your inquiries.

L. A. GREEN RAIL AND MACHINERY COMPANY
1113 First National Bank Bldg., Pittsburgh

Sacrificing Prices for Quick Sale

1—CE-6—Sullivan Shortwall.
2—CE-7—Sullivan Shortwall.
1—12-DA—Goodman Shortwall.
3—Type SA Morgan-Gardner Shortwall.
3—29-B Jeffrey Arcwalls. Any gauges on above machines. Immediate shipment on any size rail.

Phone—Wire—or Write Your Needs.

OPERATORS' SUPPLY CO.
H. G. Clark, Gen. Mgr., Huntington, W. Va.

RAILS

TRACK EQUIPMENT

COMPLETE STOCK OF ALL MATERIAL FOR SIDINGS and MINE TRACKS. NEW and USED.

W. C. BRIDDELL CO., Inc.
BALTIMORE, MD.

IRON and STEEL SCRAP
RAILROAD and PLANT DISMANTLING PROPOSITIONS INVITED.

RELAYING RAILS

600 tons 20 lb.	420 tons 60 lb.
400 tons 25 lb.	100 tons 85 lb.
170 tons 30 lb.	2000 tons 90 lb.
300 tons 40 lb.	160 tons 100 lb.
250 tons 56 lb.	

All rails complete with Angle Bars.

Rails now in loading. Prompt shipment can be made. Write or wire for quotations.

LOUIS COHEN & SON
Wilkes-Barre, Pennsylvania

STEEL RAILS

Locomotives, Cars, Steam Shovels, Locomotive Cranes

Vulcan Air Compressor 1936 cubic feet.
Vulcan 36 in. ga., 20 ton, 11 x 16 in., 0-4-0 Locomotive.
Vulcan 36 in. ga., 15 ton, 10 x 14 in., 0-4-0 Locomotive.
American 36 in. ga., 18 ton, 10 x 16 in., 0-4-0 Locomotive.
Jeffrey Belt Conveyor, 720 ft. 30 in. 6 ply belting with pulleys, rollers, etc.
Corliss Engine 16 in. x 36 in.
All overhauled, strictly first-class, ready for service.

E. C. SHERWOOD
50 Church Street, New York

FOR SALE

Two Ironton Storage Battery Locomotives $1600 each

These locomotives are 36-in. gauge, 4½ tons, low coal type. They have been used very little and practically as good as new. They do not have batteries.

WRITE

COLONIAL POCAHONTAS COAL CO.
P. O., Avondale, W. Va.

RELAY RAILS

300 ton, 25 lb.	250 ton, 60 lb.
100 ton, 35 lb.	110 ton, 70 lb.
300 ton, 40 lb.	160 ton, 80 lb.

THE MORRISON & RISMAN CO.
Buffalo, N. Y. Pittsburgh, Pa.

RAILS

All weights, new and relaying.

Prompt Shipments.

Iron Trade Products Company
Farmers' Bank Bldg., Pittsburgh, Pa.

MINE CARS

Thirty cars in excellent shape. 36 in. track gauge. Low price. Immediate shipment.

T. H. EDELBLUTE COMPANY
1214 Fulton Bldg., Pittsburgh, Pa.

New Rails—Relayers

Cars, Locomotives, Steel Products

Send us your inquiries.

MERCHANTS STEEL & SUPPLY CO.
208 S. La Salle St., Chicago, Ill.

RAILS—new and relaying: also accessories. Prompt shipment from stock. **We buy and sell Iron and Steel Scrap.**

Yards: St. Louis and Madison, Ill.

Standard Rail & Steel Co.
1110 Boatmen's Bank Building
St. Louis Mo.

RAILS

Prompt Shipment

Good stocks of Mine Rails, also
New and Relaying Heavy Section Rails.

MID-CONTINENT EQUIPMENT & MACHINERY CO.
Security Building, St. Louis, Mo.

HYMAN MICHAELS CO.

RAILS—RAILS—RAILS

531 Peoples Gas Building, Chicago NEW YORK ST. LOUIS PITTSBURGH

To make the knowledge of one the knowledge of many

is the function of publicity

NO ONE FACTOR in life is more important than Publicity. Electricity and steam can be applied to only certain of life's problems, while by publicity alone is the application of electricity and steam to the affairs of life made possible. No progress is attainable without publicity, for unless the knowledge of one becomes the knowledge of many, that knowledge is ineffective. What one man knows cannot be of any real value to humanity unless it is shared. If Faraday had kept his discoveries to himself, Thomson, Houston and Thomas Edison would have had no foundation on which their work could have been laid.

Schools and colleges register the learning of the past. To the technical press we must look for the learning of the present and the future. Its duty is to ferret out the man who has knowledge peculiar to himself and to place that knowledge where it will permit other minds to receive it and other intellects to develop it. It is the driving force of industry, as the non-technical press is the developing influence of other forms of civilization.

COAL AGE realizes this. It seeks the man with the exceptional thought, the new method, the original plan, the unheralded device, and makes his thought, his method, his plan or his device a recognized part of industry and prevents these intellectual gifts being bounded by the limited horizon and opportunities of one man.

NEXT WEEK *Coal Age* will tell you about some of these closely-held facts—the knowledge of a few — in full confidence that the publicity will make them the rich heritage of many.

It will tell of the theories regarding certain kinds of mine-roof mishaps and, better yet, of the methods adopted for their successful correction.

It will discuss the needs of mine-truck design and show how they may be met. Roller bearings when first introduced for mine trucks were expected to be unfailingly efficient. But they needed to be put in such a boxing and on such an axle as would permit their work to be satisfactorily performed, yet for a long time they were not. Today we use boxings and axles with which they work admirably, and no one questions their utility. The article describes one of these.

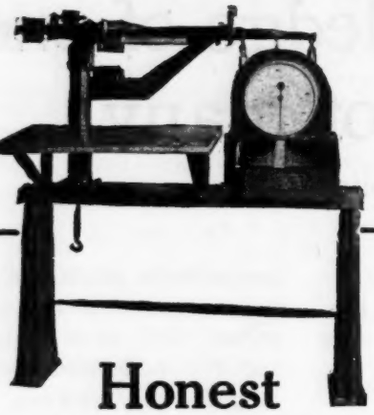
One of the clever Blueprinted Greetings which the Lehigh Valley Engineers send to their friends each year. This is the missive sent out by the Wyoming Division of that company.

It will give you a glimpse of the possibilities of the chemistry of coal. We have had glimpses in the past. They are daily becoming clearer. After you have read one of the articles next week you will be a little nearer the goal at which we all wish to arrive.

It will describe a new mine-rescue apparatus. The best brains of two continents are busy on this problem. It is conceded by everyone that rescue apparatus is not by any means ideal and that only by many slow steps can we reduce weight, lengthen operating radius, increase reliability and develop flexibility to the needs of the wearer. The Briggs apparatus is a new development of interest to all coal men.

THESE are four articles written by men who have given thought, time, energy and experience to your problems. Open *Coal Age* next week and the work they have done will become yours by that power of publicity which is the basis of progressive industry and advancing civilization.

No Argument



Honest Weight at the Tipple

Your Weigh-bo-s can make just as many mistakes detrimental to your interests as he can against the miners. And then think of the disputes and dissatisfaction. The

Streeter-Amet Weight Recorder

removes all possibilities of mistakes by human elements in weighing. It operates automatically, precisely and gives a permanent record of every car that passes over the scales. Can be attached to any make of scale.

Sold outright or rented for small monthly consideration. Write for complete details.

Streeter-Amet Weighing & Recording Co.
4101-4105 Ravenswood Ave., Chicago, Ill.

WILLIAMS COAL CRUSHERS

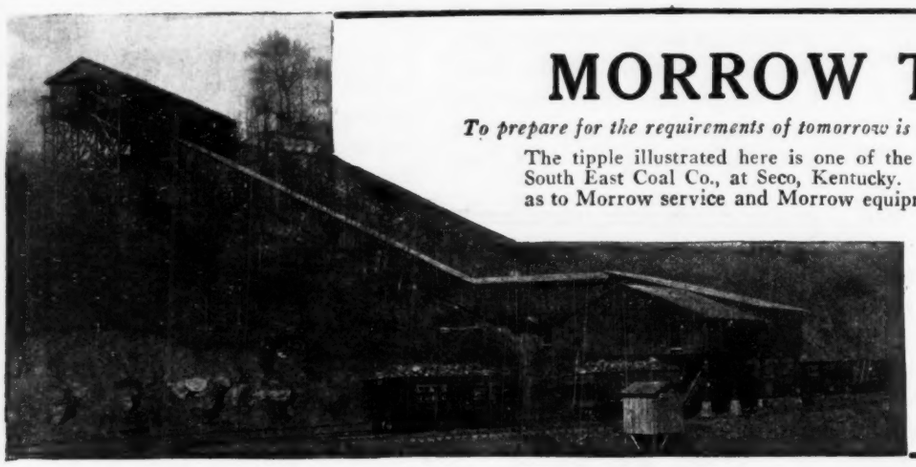
Reduce Run of Mine and Lump Coal to proper size for stokers and chain grates or bee-hive ovens with Williams Crushers.

The Williams Patent Crusher & Pulverizer Company
General Sales Department, 37 W. Van Buren St.,
CHICAGO
Plant—St. Louis 67 2nd St., San Francisco
Makers of the well-known Williams Hammer Crushers. Write for Bulletin No. 5.

Myers-Whaley Mine Shoveling Machine

Shovels as much material as 15 or 20 men—Loads 200 to 300 tons per shift—In use now in all kinds of mines—Applicable in coal seams over 5 ft. thick.

Myers-Whaley Co., Knoxville, Tenn.



MORROW TIPPLES

To prepare for the requirements of tomorrow is to install Morrow Equipment today.

The tipple illustrated here is one of the plants we have equipped for The South East Coal Co., at Seco, Kentucky. We can refer you to this company as to Morrow service and Morrow equipment.

The Morrow Manufacturing Co.
Wellston, Ohio

UFCO UNION FUEL COMPANY

A COMPANY WITH DEFINITE IDEALS.

UNITING:
MINES OF ESTABLISHED REPUTATION
COMPACTNESS OF LOCATION
UNEXCELLED TRANSPORTATION
EXPERIENCED SUPERVISION
EFFICIENT SERVICE TO CUSTOMERS

EXECUTIVE OFFICES
Lytton Building, Chicago

L. J. PULLIAM, President
ANDREW STEVENSON, V.-Pres.
B. F. BLISS, Auditor

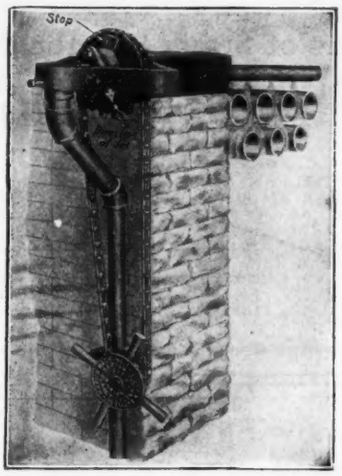
OPERATING and SALES OFFICES
Reisch Building, Springfield, Ill.

G. W. HATCH, Sales Manager
H. E. SMITH, Gen'l Supt.
L. S. SHORT, Purchasing Agent

MINES LOCATED AT

No. 1 Nilwood, Ill.
No. 2 Keys, Ill. (Tuxhorn)
No. 3 Auburn, Ill.
No. 4 Athens, Ill.
No. 5 Selbytown, Ill.
No. 6 Girard, Ill. (Ridge)

Get it all



Get all the heat from your fuel; get all the soot off the boiler tubes, with

Marion Soot Blowers

Here is an efficient installation for every type and size of boiler.

Marion Machine Foundry & Supply Co.

Box 950, Scottdale, Pa.

MARION MINING MACHINERY

NEWPORT NEWS NORFOLK

COAL

BUNKERS EXPORT

COREMAN MAKES GOOD

The Wm. Cory-Mann George Corporation

26 Beaver Street
New York

Cable Address "Coreman"

President E. D. Enney

General Sales Manager J. W. Darville

BALTIMORE PHILADELPHIA

COVINGTON COKE MACHINES

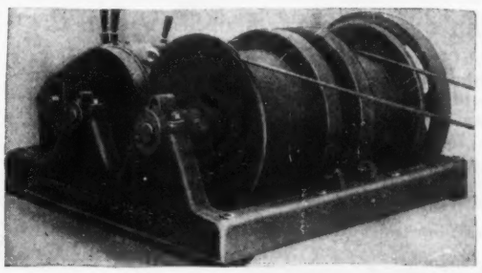
Comparisons

There are more than one hundred times as many Covington Coke Drawers and Loaders in operation today than all other makes combined. Covington Machine handled ovens require but ½ hour exposure to air in the quenching process, when recharging may commence. When this work is done by hand 2 to 3 hours are required.

Covington Machines serve to conserve oven heat so that the blaze will come from the tunnel head in from 15 to 20 minutes after oven has been recharged, thereby insuring the full 48 or 72 hours, as the case may be, for burning.

Ask us to tell you full details about Covington Machines.

COVINGTON MACHINE CO.
INCORPORATED
Covington, Virginia



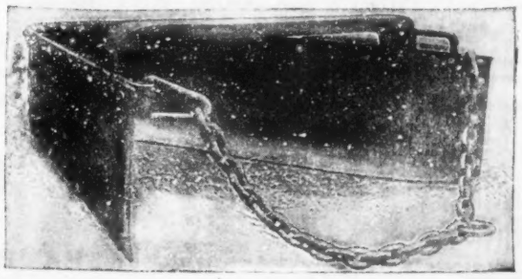
DIAMOND
Scraper Loading Apparatus

Loads coal from rooms into cars standing in entry. No need for tracks in rooms. Eliminates necessity for removing bottom or roof rock for headroom.

Cars are handled by locomotives in unbroken trips—no time lost placing cars.

Diamond Scraper Loading Apparatus increases output and saves money on equipment everywhere. Write for our proposition. No obligation is thus incurred.

Diamond Machine Company
Monongahela, Penna.
SELLING AGENTS:
Cooke-Wilson Electric Supply Co. Pittsburgh, Pa.
Cooke-Wilson Co. Charleston, W. Va.



THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Builders since 1868 of Water Tube Boilers of continuing reliability

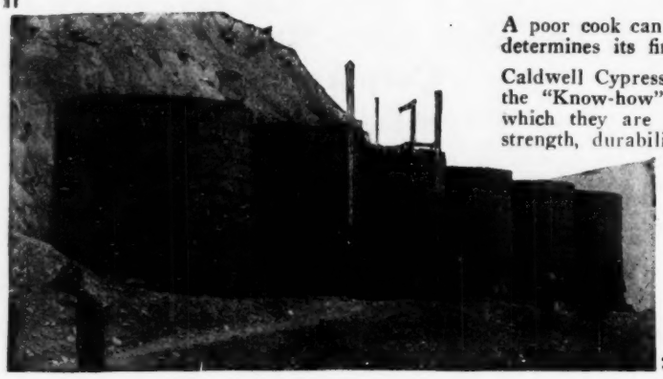
BRANCH OFFICES
BOSTON, 49 Federal Street
PHILADELPHIA, North American Bldg.
PITTSBURGH, Farmers Deposit Bank Bldg.
CLEVELAND, Guardian Bldg.
CHICAGO, Marquette Building
CINCINNATI, Traction Bldg.
ATLANTA, Candler Bldg.
TUCSON, ARIZ., 21 So. Stone Avenue
HONOLULU, H. I., Castle & Cooke Bldg.

WORKS
Bayonne, N. J.
Barberton, Ohio

Makers of Steam Superheaters since 1898 and of Chain Grate Stokers since 1893

BRANCH OFFICES
NEW ORLEANS, 533 Baronne Street
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 705-6 Kearns Bldg.
SAN FRANCISCO, Sheldon Bldg.
LOS ANGELES, 404-406 Central Bldg.
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
HOUSTON, TEXAS, Southern Pacific Bldg.
SAN JUAN, PORTO RICO, Royal Bank Bldg.

It's the Knowing How



A poor cook can spoil the most excellent food. It's the knowing how that determines its final quality.

Caldwell Cypress Tanks are finished products par excellent and backed by the "Know-how" of over thirty years experience. The fine materials of which they are made are not in themselves sufficient to give maximum strength, durability and tightness. It is the training and thoroughness of expert and experienced tank builders that have established for all Caldwell Tanks their enviable reputation.

Write for Catalogue

W. E. CALDWELL CO.
Incorporated
2070 Brook St., Louisville, Ky.

Caldwell TANKS AND TOWERS

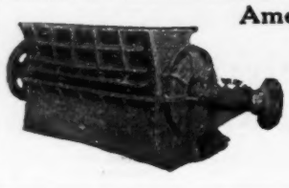
Improved Breaker Machinery for the Preparation of Coal

Simplex Jigs—Lloyd Compound Gear Driven Rolls—Parrish Flexible Arm Shakers—Keystone Rivetless Chain in High Carbon Steel, in Manganese Steel and in Malleable Iron.

WILMOT ENGINEERING CO., Hazleton, Penn.
Works: White Haven, Penn.

Malcolmson Briquet Engineering Co.
Consulting and Contracting
New York Chicago St. Louis

Complete coal briquetting plants using Rutledge, Komarek or improved roll-type presses.



American Ring Coal Crusher
350 Tons per hour—100 H.P. motor, 600 R.P.M.
One set of grinding parts good for ONE MILLION TONS.

American Pulverizer Co.
18th and Austin Streets
St. Louis, Mo.

GENERAL BRIQUETTING CO.
Consulting Engineers
25 Broad Street, New York
Specialists in the Briquetting of Coals, Coke, Lignites, etc.

COAL OPERATORS

who are using Simplex Rivetless Chain operative on double flanged sprockets specify no other, as this driving principle has proven a saving of fully 20% over inside drive and riveted types. THERE'S A REASON. Write for details. Made 6 and 9-in. pitch.

CROSS ENGINEERING CO., Carbondale, Pa.

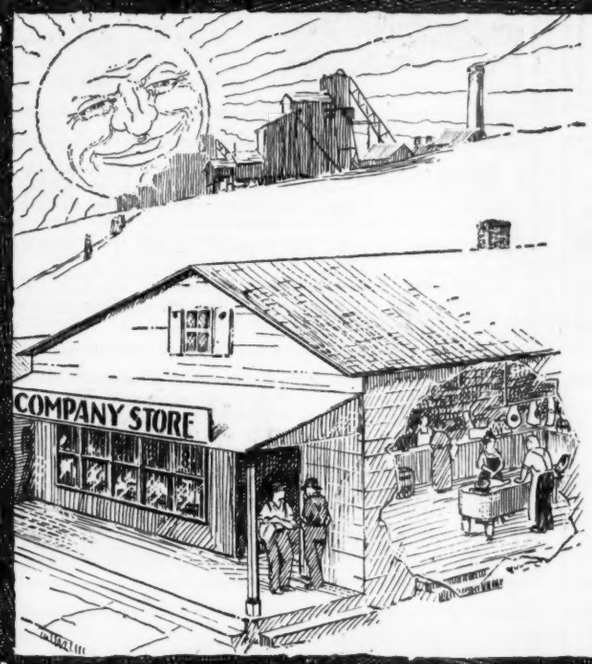
PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Building, Philadelphia
New Bulletin 1006-D sent on request.

NEW YORK CLEVELAND

BERTHA COAL COMPANY

GENERAL OFFICES:
CHAMBER OF COMMERCE BLDG.
PITTSBURGH, PA.

DETROIT CORRY



"Good Morning Mrs. Kuroski!"

—says the butcher, "How's Mike and the ten little skys? Bet you'd like some beef and nice vegetables?

"He fresh?"

"Sure, *he* fresh. Everything fresh here since we got our Automatic Refrigerator."

An Automatic Refrigerating Plant will enable you to supply fresh meats and vegetables in season—foodstuffs you can buy in favorable markets and store until used, without an ounce of waste. No bother, it takes care of itself. Electrically driven, it requires but 40 kw.-hr. to equal the refrigeration of a ton of ice.

Write for complete details.

The Automatic Refrigerating Co.

Main Office and Works: Hartford, Conn.

Branch Sales and Service Offices: New York, Louisville, Washington, Chicago, Cleveland, Rochester, Boston, Baltimore, Houston, Atlanta, Seattle, San Francisco, Los Angeles, New Orleans.

WOODEN TANKS

For Every Purpose

Exceptionally well constructed; scientifically designed and made of the most suitable wood—that's why

Hauser-Stander Tanks Win on Quality

Consult with us about the tank you need. We'll co-operate in every way to insure you absolute satisfaction.

New York Office: 103 Park Ave.

Will exhibit at Sixth National Exposition of Chemical Industries at Grand Central Palace, Space No. 703.

The HAUSER-STANDER TANK & CINCINNATI, O. U. S. A.

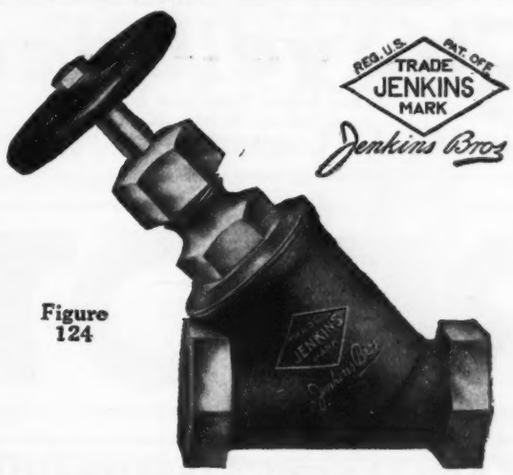


Figure 124

Jenkins Standard Brass Y or Blow-Off Valves

For 150 pounds working steam pressure; 250 pounds working water pressure. Fitted with Jenkins discs and renewable seat rings. Have full opening nearly in line with the pipe. Particularly adapted for boiler blow-off service, also extensively used where thick fluids are handled. Screwed or flanged types.

Genuine Jenkins Valves are known by the name and Jenkins Diamond Mark—at supply houses everywhere.

JENKINS BROS.

New York, Boston, Philadelphia, Washington, St. Louis, Chicago, San Francisco, Pittsburgh, Montreal, London, Havana

Jenkins Valves SINCE 1864 2223-J

TIPPLE Equipment

The C. O. Bartlett & Snow Co.
Cleveland, Ohio

—particularly for conditions which are unusual or exacting.

Toledo Pipe Tools

will thread pipe with less labor than anything else on earth. Ask for "the reasons why."

The Toledo Pipe Threading Machine Co.
Toledo, Ohio

Early Deliveries On Standard "Marion" Models

The Marion Steam Shovel Co.
Marion, Ohio, U. S. A.

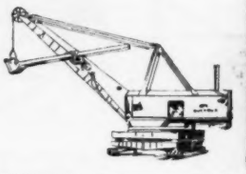
ROBINS CONVEYING MACHINERY

Our Hand-book of Conveyor Practice describes the successful solution of many materials-handling problems. Write for a copy.

ROBINS CONVEYING BELT COMPANY

New York, 15 Park Row — Chicago, Old Colony Building
Salt Lake City, Newhouse Bldg. — Pittsburgh, Pa., Union Arcade Bldg.
San Francisco, The Griffin Co. — Toronto, Gutta Percha & Rubber Ltd. — Birmingham, Ala., C. B. Davis Eng. Co.

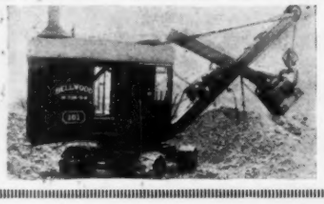
CRANE HYDRAULIC VALVES



BUCYRUS

Steam and Electric Shovels
Dredges - Dragline Excavators
— Coal Loaders —

BUCYRUS COMPANY



Bellwood Steam Shovels

Weight 16 tons, ⅝-cu. yd. dippers, full revolving on traction wheels. Deliveries immediate.

Specifications and prices on request.

The Bellwood Steam Shovel Co., Inc.,
Bellwood, Pa.
Philadelphia Sales Office
J. M. Reed Co., Inc.
516 Commercial Trust Building

DEGRACO PAINTS
ALL COLORS FOR ALL PURPOSES

DETROIT GRAPHITE COMPANY

Makers of
Paints in All Colors for All Purposes
102 Twelfth Street, Detroit, Michigan
Offices and Warehouses in All Principal Cities

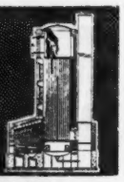
Mechanize Your Shoveling—

Shuveloder

Saves labor, time and money
Ask for Bulletin 2C
Lake Superior Loader Co. Duluth, Minn.

WICKES BOILERS
VERTICAL WATER TUBE TYPE

Ask for Aids in the Selection of a Boiler; Reducing Costs in the Boiler Room; Magnitude and Prevention of Air Infiltration Losses. Sent Free.



THE WICKES BOILER COMPANY
SAGINAW, MICH. U.S.A.

ROOT

Spiral Riveted Pipe—
Pipe Specialists for 48 years.
Abendroth & Root Mfg. Co.
Works: Newburgh, N. Y.
N. Y. Office: 233 Broadway

STEEL LOCKERS

Send for Catalog A-6

FRED. MEDART MFG. CO
Potomac & De Kalb Sts. ST. LOUIS, MO.

New York—52 Vanderbilt Ave.
San Francisco—Rialto Bldg.

MEDART means **EVERYTHING** in Line Shafting Equipment

MEDART PATENT PULLEY CO.
General Offices and Works, St. Louis, U. S. A.

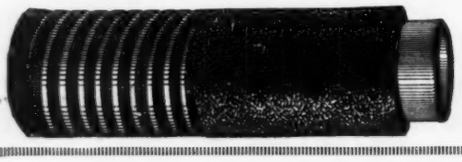
THE SCOOP CONVEYOR

THOUSANDS IN USE

FOR STORING AND RECLAIMING, LOADING AND UNLOADING CARS, TRUCKS AND WAGONS
DOES THE WORK OF FROM 6 TO 12 MEN
AND KEEPS EQUIPMENT MOVING
WRITE FOR LITERATURE

PORTABLE MACHINERY CO., PASSAIC N.J.

Acid-Proof Wood Pipe for mine water



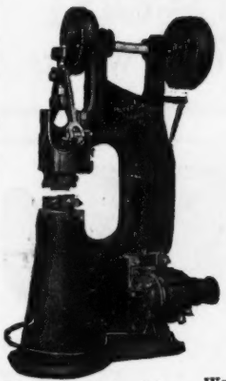
The Michigan Pipe Co.,
Bay City, Michigan

WE-FU-GO AND SCAIFE

WATER PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

LITTLE GIANT POWER HAMMERS



Are used in more than 1000 American Mines, some companies having re-ordered until all their shops are equipped.

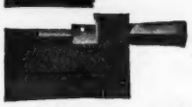
Will pay for themselves every month of steady work and continue to do so for fifteen to twenty years.

Have very small unkeep—our annual repair sales average 18c. each on all sizes and ages in use, or less than 2/5 of 1% of the original cost to buyers.

Are guaranteed FOREVER against defective material and workmanship, and sold on 30 days trial, by a manufacturer that commenced business in January, 1876—44 years ago.

Prompt shipments of all sizes.

Motor or belt driven in 25-lb., 50-lb., 100-lb., 250-lb. and 500-lb. models.



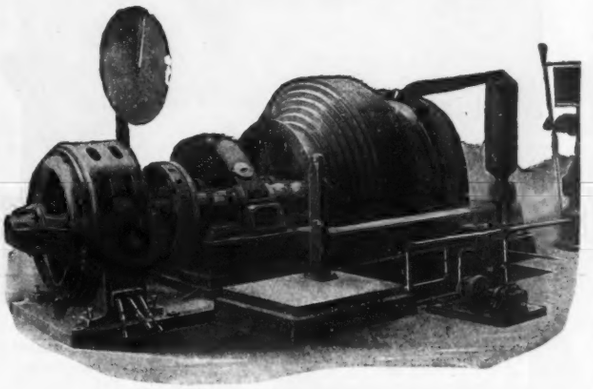
Patented Dies for manufacturing, reshaping and sharpening chisel bits, and also pick point bits, rights, lefts, and centers.

We make dies for every special forging purpose. One man, with the dies here shown, will do as much as seven good men in the old way, and of much better quality — saving enough in 100 hours steady work to pay for the hammer dies.

Special Dies for manufacturing, reshaping and sharpening pick point bits, rights lefts, and centers.

Little Giant Company
102 Rock St.
Mankato, Minnesota, U. S A.

Equalizes the Load



OTTUMWA
Cylindro-Conical Drum Hoists

reduce the starting load also the energy consumed per trip, as well as horsepower of motor.

Before making a final decision on the hoist question, let us figure with you.

Our 50 years' experience in building hoisting machinery and solving all kinds of hoist problems, will prove of real benefit to you.

Your request brings the literature about hoists.

Ottumwa Iron Works, Inc.
Ottumwa, Iowa

SURE GRIP
Trolley Clamp

True Economy

This is the clamp that cannot *rust or freeze on.*

All threads are protected against corrosion. The patented sliding jam nut clamping action is the key to "Sure Grip" success. This clamp can be used an indefinite number of times. Easily put on—easily removed. Ask us about Economy in Clamps.

ELECTRIC RAILWAY EQUIPMENT CO.
2000 to 2018 Freeman Ave. Cincinnati, Ohio

MAYER
Power Hammers

Are your mining machines well supplied with properly sharpened cuting tools?

The Mayer Power Hammer will do all your sharpening and will do it better and at less cost than half a dozen blacksmiths.

It turns out tools pointed —up to specification.

Mayer Power Hammers are fully guaranteed as to operation and length of service.

Our catalog tells the whole story. Write for it.

Kaukauna Machine Works
105 Island
Kaukauna, Wis.

The Erie Shovel is built far stronger than the usual standard of steam-shovel construction. It is RELIABLE; also very speedy.

Production cost: Less than 50¢ per ton

E. E. Shovels have stripped off the overburden and then loaded the stripped coal into cars, at a total cost well under 50c. per ton.

If your acreage contains any coal that can be mined by the strip-pit method, you may find that the per-ton profits on stripped coal are much higher than would be expected.

We have some interesting data on strip-pit mining which we will be glad to send you. Write for Bulletin A.

BALL ENGINE CO., Erie, Pa.
Builders of ERIE Steam-Shovels and Locomotive Cranes

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.

SPECIFY "CHATTANOOGA"

and you'll secure 100% efficiency in motor service. Over a quarter century in manufacturing electrical equipment supports our claim for superiority.

Let us know your needs.

CHATTANOOGA ARMATURE WORKS
Chattanooga, Tenn.

Every Day Duty or When a Crisis Comes

A never-failing agent of intelligence between Mine and Man. There is no mistaking the powerful, destructive voice of the *Sterling Electric Mine Siren*. It is used extensively to give work signals and as an alarm in case of fire, accident, riot, etc.

Interstate Machine Products Co., Inc.
45 Allen St., Rochester, N. Y.

C-H
Battery Charging Racks for Miners Lamps
The CUTLER-HAMMER MFG. CO.
MILWAUKEE and NEW YORK

Federal Electric Mine Siren

A weird, penetrating signal everyone hears and no one mistakes.

Write for bulletin.

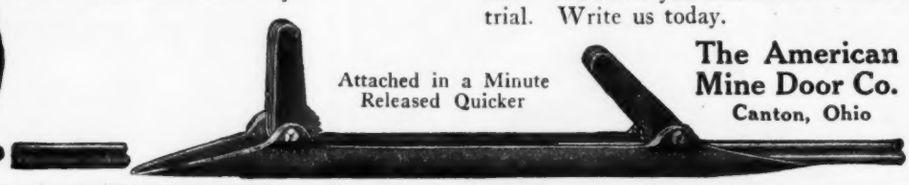
Federal Electric Company
Representing
Federal Sign System (Electric)
State and 87th Sts., Chicago, Ill.

MOMENTS MEAN DOLLARS

When the trolley wire is down
THE CANTON TROLLEY WIRE SPLICER REPAIRS IT QUICKLY

After the wire is drawn together it is instantly attached. The dogs will hold the wire with vicious tenacity.

Keep several on every locomotive and in the store room. A great emergency device. We know you will like it—sent on trial. Write us today.



Attached in a Minute
Released Quicker

The American Mine Door Co.
Canton, Ohio

If there is anything you want—

or something you don't want that *other* readers of this paper can supply—or use—advertise in the

Searchlight Section

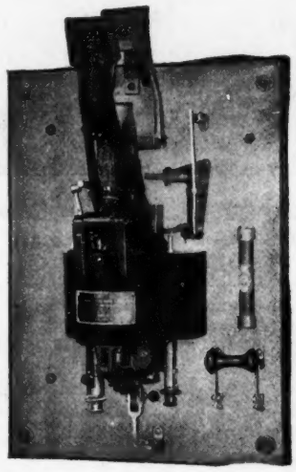
NOW— is the time to offer good second-hand equipment or machinery for sale. The demand is great for good plant for immediate delivery. That's why you should advertise NOW.

NOW— or any other time, use the Searchlight Section for advertising

Agencies Wanted	Contracts Wanted	Miscellaneous Wants	Positions Wanted
Agents Wanted	Educational Courses	New Industries Wanted	Property For Sale
Auction Notices	Employment Agencies	Partners Wanted	Receivers' Sales
Buildings For Sale	Exchanges	Patents For Sale	Representatives Wanted
Business Opportunities	For Rent Items	Patent Attorneys	Salesmen Wanted
Civil Service Opportunities	Franchises	Plants For Sale	Work Wanted
Contracts To Be Let	Industrial Sites	Positions Vacant	Etc., Etc., Etc.

35

The Automatic Reclosing Circuit Breaker



"The Circuit Breaker With Brains"

Knows—not only
When to Open, but also
When to Reclose—and does it
Automatically

For the sake of complete protection to your equipment and service

"Lets get acquainted"

The Automatic Reclosing Circuit Breaker Company
Columbus, Ohio
SOLE MANUFACTURERS OF FULL AUTOMATIC BREAKERS

For Railbonding and General Repairs

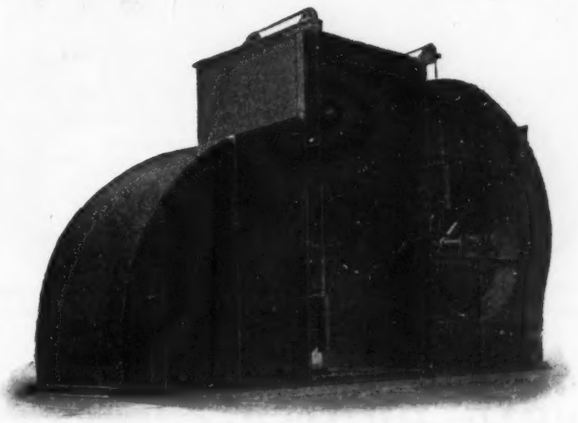
Wherever the power lines run—Power House Tipple, Haulage Roads, Pump Room or Mining Face—this light apparatus can be carried by one man; and will render invaluable service. Broken castings of any kind can be saved—leaky pipes repaired—keyways reshaped—a hundred other varieties of repairs made at great saving of time and money.

Write for details

The Electric Railway Improvement Co.
CLEVELAND, OHIO

No coal plant is complete without it. Total weight of equipment only 50 lbs.

BUCKEYE



MULTIBLADE FAN

Built reversible for large mining operations. Can be changed from a blower to an exhauster while running. Simple in construction and absolutely reliable in operation, Buckeye Multiblade Fans are everywhere boosting production.

Bulletin 101 gives sizes, capacities and power required.

Write Dept. "A"

BUCKEYE BLOWER COMPANY
Columbus, Ohio

GEAR AND FRICTION DRIVEN GASOLINE LOCOMOTIVES—2½ TO 25 TONS ON DRIVE WHEEL

WHITCOMB LOCOMOTIVES

IT WILL PAY YOU TO GET OUR PROPOSITION BEFORE YOU BUY

GEO. D. WHITCOMB CO.

MAIN OFFICE AND WORKS

ROCHELLE, ILLINOIS

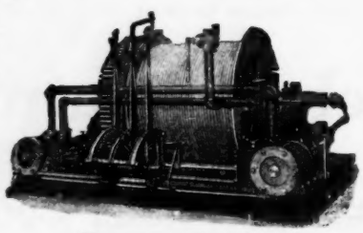
U. S. A.

STORAGE BATTERY LOCOMOTIVES—1 TO 8 TONS ON DRIVE WHEELS

Flory Hoists

stand up to the job, and stay on the job, to the finish. Rugged designs—liberal and well-finished wearing surfaces—many types for every mining need—steam, electric or air-operated.

Complete illustrated catalogue on request.



Single Drum Steam Hoist

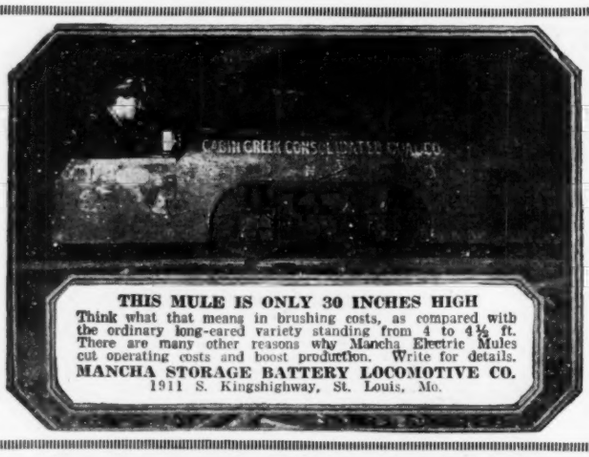
S. Flory Mfg. Co., Works: Bangor, Pa.

New York 95 Liberty St. | Chicago Monadnock Bldg. | Pittsburgh 1st Nat'l Bank Bldg.

DINGS MAGNETIC PULLEYS

They're Correct Electrically and Mechanically

DINGS MAGNETIC SEPARATOR CO.
Milwaukee, Wisconsin.

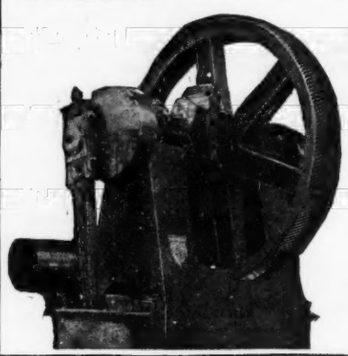


THIS MULE IS ONLY 30 INCHES HIGH

Think what that means in brushing costs, as compared with the ordinary long-eared variety standing from 4 to 4½ ft. There are many other reasons why Mancha Electric Mules cut operating costs and boost production. Write for details.

MANCHA STORAGE BATTERY LOCOMOTIVE CO.
1911 S. Kingshighway, St. Louis, Mo.

FALK HERRINGBONE GEARS



For quiet efficiency you can depend on Wuest accurately machined herringbone gears.

Descriptive literature on request

The Falk Co.
Milwaukee, Wis.

AMERICAN Gasoline Locomotives

"RUN RIGHT"—Above and below ground

Write for literature

The Hadfield-Penfield Steel Co., Bucyrus, O.

Section Insulator and Switch

Our Combination Insulator and Switch when closed also closes the gap in the trolley line. There's no dead section and no arcing when trolley wheel passes over.

Illustrated bulletin and prices sent.

Flood City Mfg. Co.
Elder and Messenger Streets
Johnstown Penna.

Keystone Overhead Material

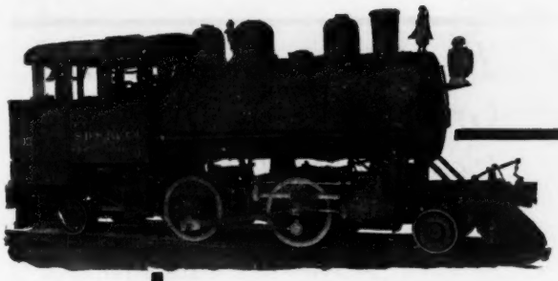
It is the kind to use—strong, durable, moisture-proof, unaffected by the highest degree of atmospheric heat.

ELECTRIC SERVICE SUPPLIES CO.
PHILADELPHIA, 17th and Cambria Sts.
NEW YORK, 50 Church St. CHICAGO, Monadnock Bldg.
PITTSBURGH, 337 Oliver Bldg.
SCRANTON, 316 N. Washington Ave.

Mine Hoists and Mining Machinery

Send for our Bulletins

The Wellman-Seaver-Morgan Co.
Cleveland Ohio

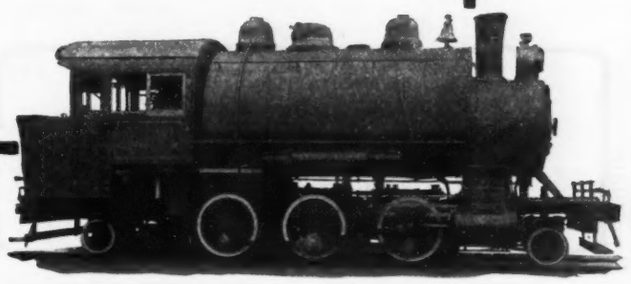


For the Hard Work—
PORTER'S

The careful design and construction of PORTER Locomotives is apparent in their ability to absorb the hard work—to climb steep grades and hang on to sheer curves.

Whether for mine, mill or quarry use, PORTER'S have a habit of delivering satisfactory service.

H. K. PORTER COMPANY
Pittsburgh, Penna.



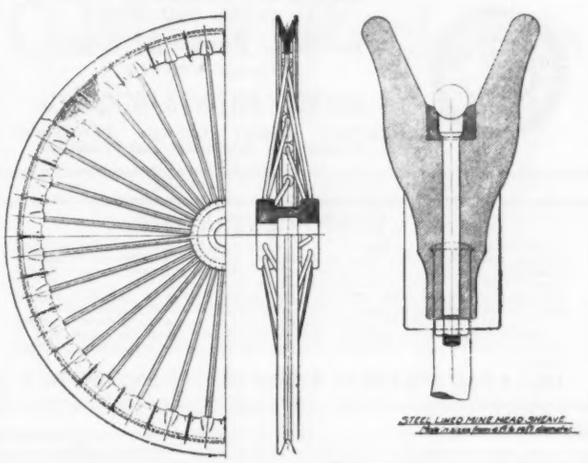
EST. **STINE** 1874.

STINE
Incline Machines

are "tailored to order" to meet special requirements in the service where they are to be used. We have marketed to date more than 50 different styles and sizes. Stine Incline Machines fit their job, whether it's at the Equator or in frozen Alaska—we have them in service in both places.

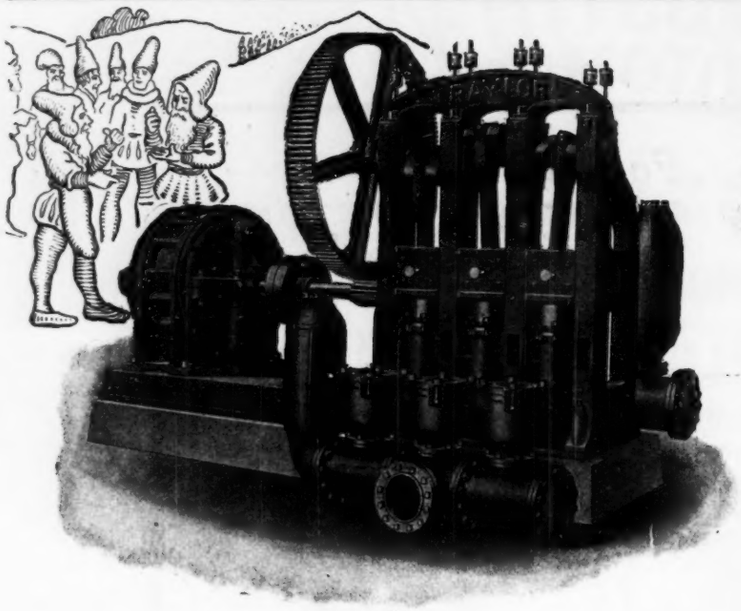
Write for catalogue of Incline Machines, Dise Fans, Hoists, Pumps, Mine Cars and other mining equipment.

S. B. Stine, P. O. Box 11 **Osceola Mills, Pa.**



We are the original builders of REAL steel lined mine sheave wheels. Let us tell you more about them and quote you prices on any size as mentioned above.

ROBT. HOLMES & BROS. INC.
DANVILLE, ILL



The Superpump Handles Gritty and Acid Water Economically

Economically—that's what pleased our ancient visitors.

No wonder, for every part of the Superpump, from its bronze linings for working barrel throats, glands, and stuffing box to its highly sectionalized construction as a whole, is designed to give maximum pumping efficiency with minimum wearing effect.

And when repairs must be made its this highly sectionalized construction which makes the work simple, inexpensive and rapid.

TRAYLOR ENGINEERING & MFG. COMPANY
Allentown, Pa.

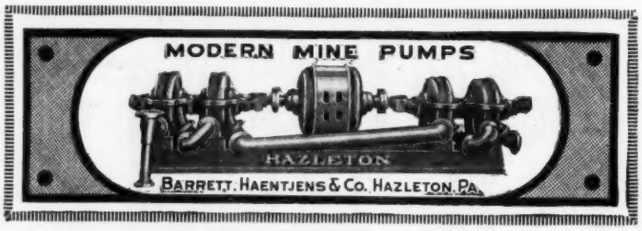
BRANCHES:
New York Chicago Pittsburgh Los Angeles Spokane
Truck and Tractor Division, Cornwells, Bucks Co., Pa.

For Immediate Delivery

8-in. "Bulldog" Gyratory Crushers
14-in. "Bulldog" Gyratory Crushers
42 x 48-in. "Bulldog" jaw Crushers
42 x 18-in. Heavy Duty Crushing Rolls

Traylor Motor Trucks and ALL-PURPOSE Tractors do the work of many teams.

RUBBER PRODUCTS FOR THE COAL INDUSTRY
Belting, Packing, Hose, Pump Valves
NEW YORK BELTING & PACKING CO
New York Boston Chicago Philadelphia
Pittsburgh St. Louis San Francisco



D.C. TURBO GENERATORS

Direct current is preferable for hauling and for the operation of coal cutters and other tools. The most simple, direct, and inexpensive way of producing it is by means of a direct-current generator driven by a De Laval Steam Turbine, using a double-helical speed-reducing gear to permit the turbine to run at the best speed for efficiency. Losses in transformers and rotary converters and complications of equipment are thus avoided.

De Laval Steam Turbines, with or without Gears, also constitute the most economical drive for centrifugal pumps and fans. Each De Laval unit is fully guaranteed as to capacity and efficiency and is thoroughly tested before shipment.

DE LAVAL STEAM TURBINE CO., TRENTON, N. J. 52

PUMPS
Electric, Steam, Boiler Feed
BOYTS, PORTER & CO.
Connellsville, Pa.

MORRIS MACHINE WORKS BALDWINSVILLE, NEW YORK
ESTABLISHED 1864

CENTRIFUGAL PUMPS
HYDRAULIC DREDGES—STEAM ENGINES

More than 55 years' experience is your guarantee that the Morris reputation will be lived up to by the Morris products you invest in. Write for Catalog.

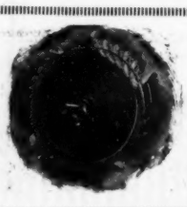
Pittsburgh Office: Harris Pump & Supply Company

MIDWEST
Dependable Power
MIDWEST ENGINE COMPANY
Indianapolis, U. S. A.

Investigate The

Renewable features

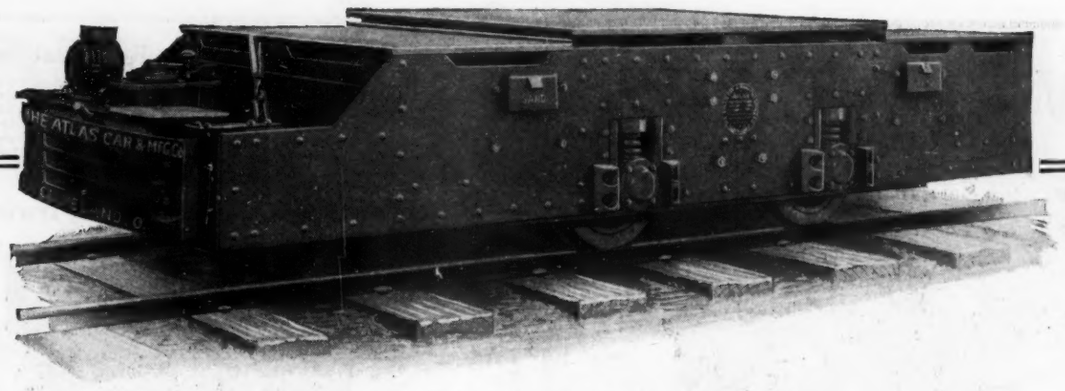
in McGowan Duplex Steam and Power Driven Pumps
THE JOHN H. McGOWAN CO.
CINCINNATI OHIO U.S.A.



THE TERRY TURBINE

is ideal for driving generators, pumps and fans for all service, because of its simplicity, efficiency and reliability. There are more than 4000 in operation.

THE TERRY STEAM TURBINE CO.
HARTFORD, CONN. T-434



Type D for Low Coal

ATLAS STORAGE BATTERY LOCOMOTIVES

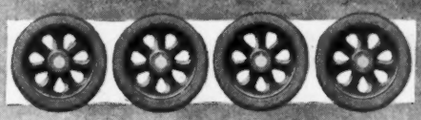
are the favorites wherever they have been tried — the reason is: "they haul more coal;" they have two motors, one for each axle with Atlas spur gear high efficiency drives mounted on ball bearings, and with every moving part absolutely enclosed and thoroughly lubricated. They are built to work efficiently in severe service—and they do it. Ask our nearest office to tell you more about them.

THE ATLAS CAR & MFG. CO.

Engineers *Manufacturers*

CLEVELAND, OHIO

New York City	Woolworth Bldg.	San Francisco	Merchants Exchange Bldg.
Chicago	53 W. Jackson Blvd.	Los Angeles	San Fernando Bldg.
Philadelphia	20 South 15th St.	Birmingham	419 American Trust Bldg.
Pittsburgh	Benedum-Trees Bldg.	Ashland, Ky	305 Second Nat'l Bank Bldg.



LOBDELL Chilled Iron Mining Locomotive Wheels

are backed by over eighty years of experience in wheel making. They are the most economical wheel that can be used for this severe service, having built into them by special processes of manufacture the ultimate of strength and wear.

Where increased traction is desired the Lobdell High Carbon Heat Treated Steel Wheel will be found the most efficient.

Send us the sizes of your locomotive wheels and axles so that we can quote you prices and deliveries that will interest you.

LOBDELL 80 YEARS OF PROGRESS

LOBDELL CAR WHEEL COMPANY
WILMINGTON
DELAWARE

Garlock Packings

Have you ever considered the loss in engine efficiency due to excessive friction on piston and valve rods caused by the use of inferior and poorly lubricated packing?

A horse power easily can be absorbed at the stuffing box and, when considered in dollars and cents at the coal pile, the loss would pay for a high class packing many times over.

Garlock packings are designed to meet every condition of service.

Write for catalog

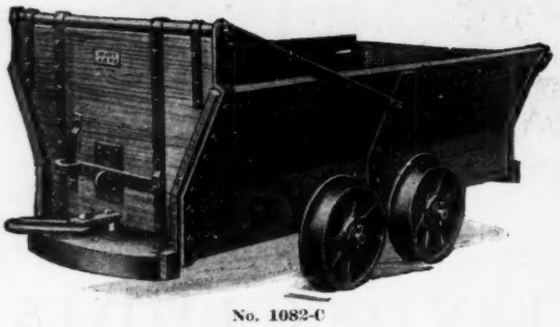
The Garlock Packing Co.

Palmyra, N. Y.

Branches

New York
Chicago
Boston
Denver
St. Louis
Pittsburgh
Philadelphia
San Francisco
Cleveland
Birmingham

WATT CARS



No. 1082-C

Cars—that's all we've built for 50 years, and the quality contained in Watt Cars has built for us the largest factory of its kind in the world.

Your inquiries will have our prompt attention.

Catalogs.

The Watt Mining Car Wheel Co.
Barnesville, Ohio

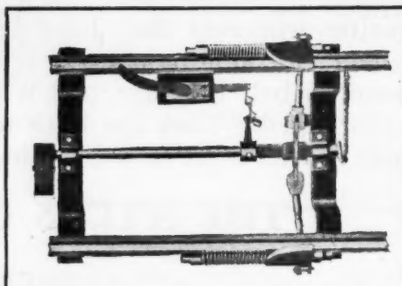
Denver: Lindrooth, Shubart & Co., Boston Bldg.
San Francisco: N. D. Phelps, Sheldon Bldg.
Philadelphia: Edelin & Co., 235 Commercial Trust Bldg.

The Car That Stands the Roughest Service

Irwin Mine Cars fill the requirements of every coal mine. They are properly proportioned to get the largest capacity possible with minimum weight. For durability, they are equipped with cold rolled steel floating axles, dustproof bearings, steel plate center bumpers, ample bracing, and many other features.

Write for details.

Irwin Foundry & Mine Car Co., Irwin, Pa.

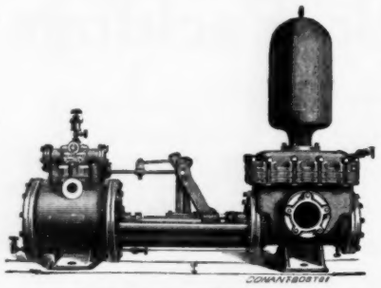


The NOLAN
Automatic Cager and Feeder

Used as cager at shaft bottoms; use as feeder for rotary and cross-over dumps; as automatic stop in rotary dump. Guaranteed.

Eliminates wrecks—pays for itself in short time. Write for literature.

The Mining Safety Device Co.
Bowerston, Ohio, U. S. A.



Regular Mine Pump

Equipped with Acid Resisting metal where parts come in contact with water.

NEW YORK SALES OFFICE, 141 Broadway
Send for Catalogue 113

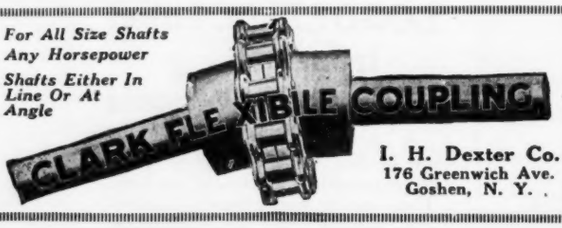
DEAN BROS. STEAM PUMP WORKS. INDIANAPOLIS.

PENNSYLVANIA PUMPS and COMPRESSORS

Pennsylvania Pump & Compressor Co. Easton, Penna.

For All Size Shafts Any Horsepower

Shafts Either In Line Or At Angle

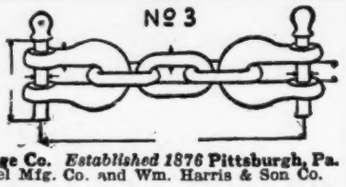


I. H. Dexter Co.
176 Greenwich Ave.
Goshen, N. Y.

PROMPT SHIPMENTS

We are prepared to furnish Hitchings, any size, style or quantity. Puncher Picks, Machine Bits and Bit Steel.

Let us quote you.



Pittsburgh Knife and Forge Co. *Established 1876* **Pittsburgh, Pa.**
Successors Pittsburgh Steel Mfg. Co. and Wm. Harris & Son Co.

DIRECT CURRENT ALTERNATING CURRENT MOTORS

Variable or Constant Speed—¼ to 50 H. P.

UNIFRAME MOTORS are especially adapted to direct motor-driven apparatus. No changes in mounting required, as dimensions of both A.C. and D.C. motors of same hp. rating are identical.

B. A. WESCHE ELECTRIC CO.
327 East Sixth Street, Cincinnati, Ohio.
Eastern Sales Office, 110 West 40th St., New York, N. Y.

Manistee Iron Works Co.

Manistee, Michigan

Centrifugal Pumps — OFFICES IN ALL LARGE CITIES — Rotary Jet Condensers

KOPPEL CARS

KOPPEL

TRADE MARK REGISTERED U. S. PATENT OFFICE

No. 803

Coal men are rapidly coming to the conclusion that it pays to operate better cars in their mines —and it really does.

A cheap undependable car invariably causes delays, tie-ups and loss of time, while the better car costing very little more gives uninterrupted service under every condition.

Bulletins on request

Sales Offices:
30 Church St., New York City
Peoples Gas Bldg., Chicago
Farmers Bank Bldg. Pittsburgh
Edw. R. Bacon Co. 51 Minna St. San Francisco
1420 Chestnut St. Philadelphia
Book Building Detroit

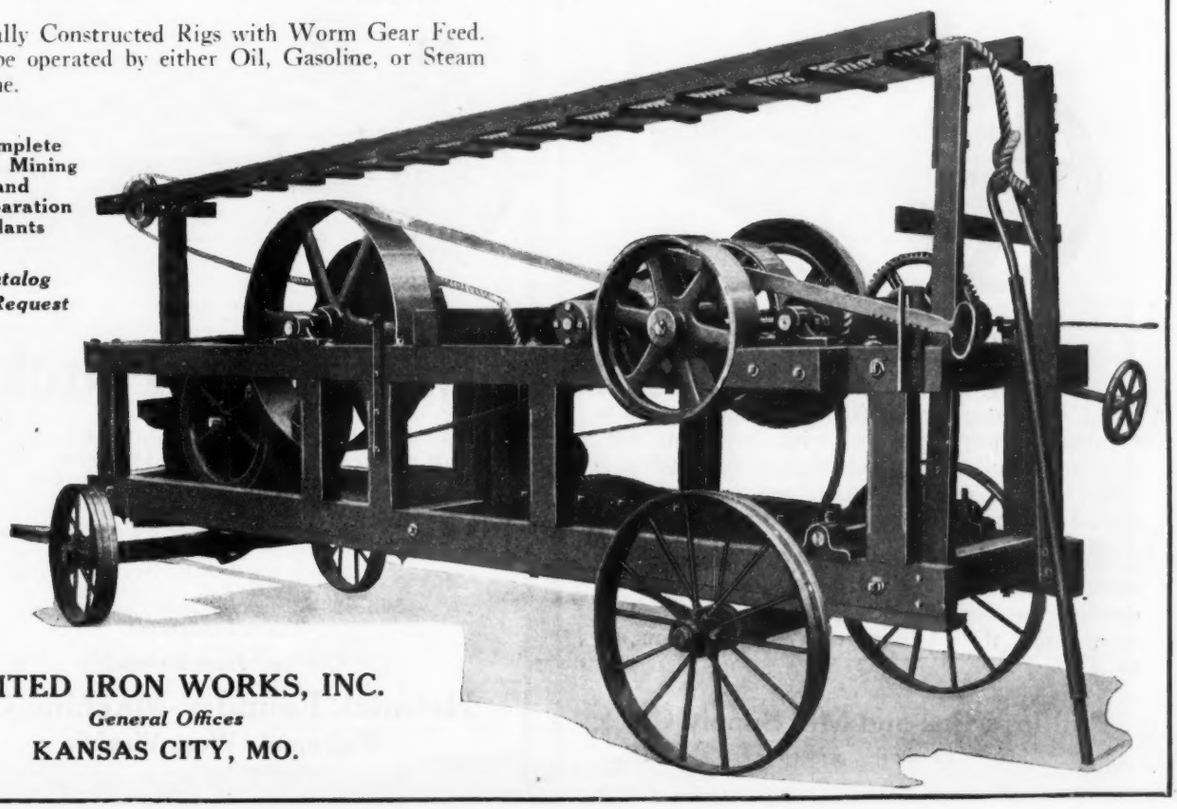
KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.
KOPPEL, PA.

COAL PROSPECTING DRILLS

Specially Constructed Rigs with Worm Gear Feed. Can be operated by either Oil, Gasoline, or Steam Engine.

Complete Coal Mining and Preparation Plants

Catalog on Request



UNITED IRON WORKS, INC.
General Offices
KANSAS CITY, MO.

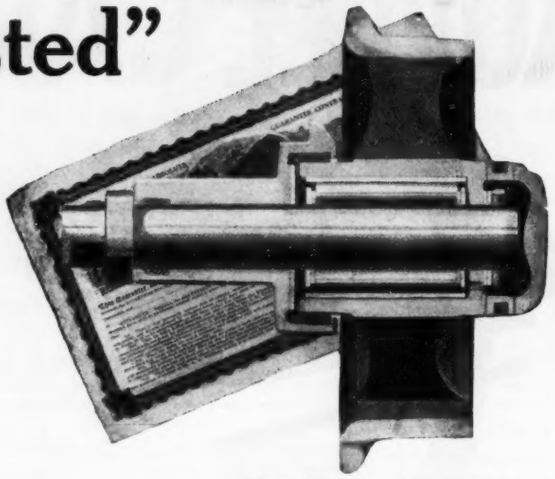
On a Par With the Best

"They're Toasted"

Mine Car Wheels are a long way from Cigarettes but "Lucky Strikes" and

ENTERPRISE Roller Bearing Wheels

have more than their excellence in common. Both are heat treated during their manufacture, to make available their best qualities. And Enterprise Roller Bearing Wheels are so carefully made that we will back them with a five years' unconditional guarantee.

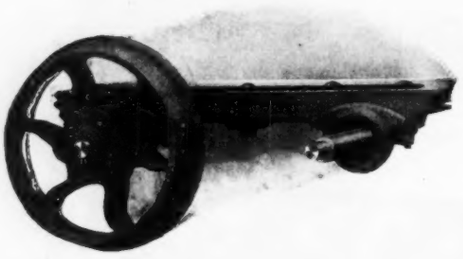


Guaranteed to endure against wear on wheel tread, flange, spokes and bearings for a period of five years.

Write for booklet "Modern Mine Transportation"

Enterprise Foundry & Machine Works
Bristol, Va. Tenn.

The Open Cap Truck
(Guaranteed)

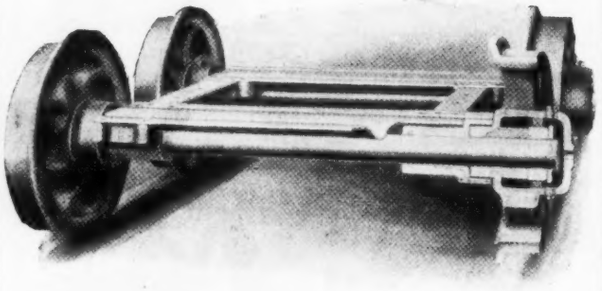


IN this Truck are combined all the essentials that go to make up a first-class Mine Car Truck. It can be lubricated with either grease or oil with long service from each lubrication—is thoroughly dustproof—runs with very little friction—has a full-floating axle with visible linch pins which can be easily replaced, and is guaranteed against internal wear.

Selected by the Atlantic Refining Co. to demonstrate, at the American Mining Congress in Philadelphia, the highest development of a self-oiling wheel using their lubricant. We'll send you details.

Phillips Mine and Mill Supply Co.
Pittsburgh, Penna.

HELMICK



Mine Car Trucks

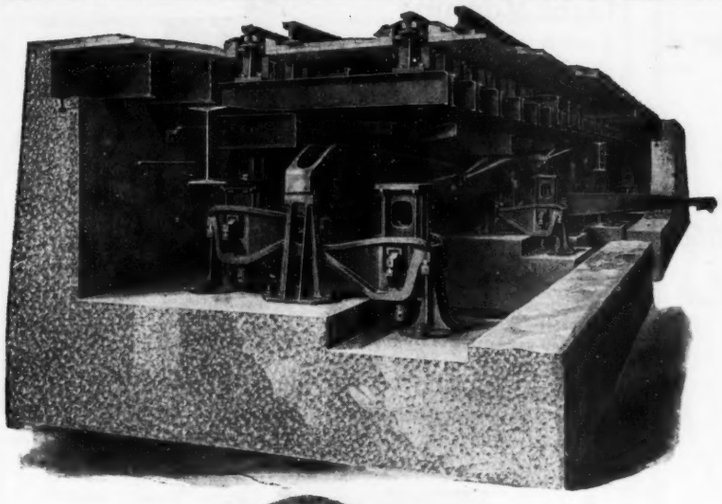
Built in the heart of the coal fields by men who know what a mine car is "up-against" in service. Helmick Wheels stand the clatter and the crash and the bang of mine service.

Helmick-Hyatt Wheels, open or closed hub; embodying simplicity, strength and durability, are fulfilling every promise made for them by the Helmick Company.

Wheels—Trucks—Cars Complete—Track Equipment

Get 'em from Helmick!

Helmick Foundry-Machine Co.
Fairmont, West Virginia



The Type "S" Track Scale will Give You Accurate Carload Weights

This scale is built rugged and strong to stand the constant hard service that a track scale receives, and yet to retain its high accuracy for many years.

The suspended platform construction assures sustained accuracy, sensitiveness and long life. It means that the load, instead of resting on the knife edges, is suspended from them, so that the effects of jars, shocks or vibrations are absorbed before reaching the knife edges.

Fairbanks Scales have for over ninety years sustained their position as the reliable weight authority.

FAIRBANKS SCALES

Fairbanks, Morse & Co.

INCORPORATED CHICAGO

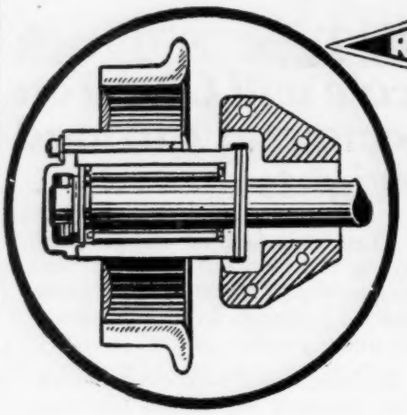
The Canadian Fairbanks-Morse Co., Ltd., Montreal

Oil Engines - Pumps - Electric Motors and Generators - Fairbanks Scales - Railway Appliances - Farm Power Machinery

WRITE FOR YOUR COPY

It tells how to reduce the cost of wear and tear- how to reduce the cost of Lubrication and just which grade of Superla Grease is the right one for your particular mine car equipment.

STANDARD OIL COMPANY
(INDIANA)
CHICAGO, ILLINOIS.



RAMSCO

Roller Bearing Wheels

WE believe in the honesty of our materials, the thoroughness of our workmanship, the harmony of our business treatment, and the high quality of our finished product.

These beliefs are supported by a most liberal offer to users of mine car wheels, enabling you to make a practical comparison in actual service.

Complete details in our new bulletin, sent on request.

Railway and Mine Supply Company
Chicago, Illinois

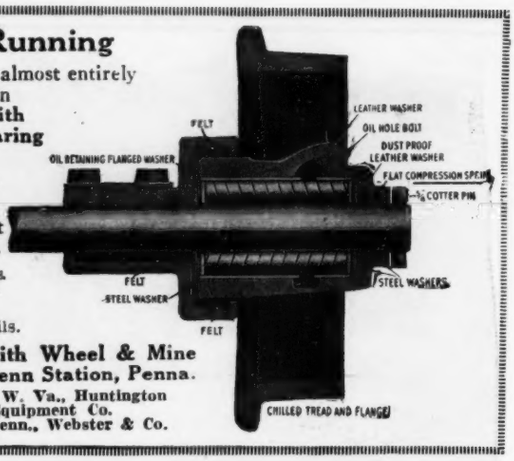
Light Running

Friction is almost entirely overcome in **Hockensmith Roller Bearing Wheels**

Completely protected against dust and water.

Big oil savers. Unsurpassed Durability

Ask for details.



Hockensmith Wheel & Mine Car Co., Penn Station, Penna.
Huntington, W. Va., Huntington Supply & Equipment Co.
Knoxville, Tenn., Webster & Co.

KEYSTONE GREASE

There's a special Keystone Density, scientifically suited for every type of mine car wheel. Keystone Grease No. 119 Medium for Hyatt Roller Bearing Wheels. Keystone Grease No. 119 for wheels of all other types.

Write for Bulletin No. 26

The Keystone Lubricating Company
Executive Offices and Works, Philadelphia, Pa.
Established 1884
Branches throughout the World

The HOLLOW AXLE MINE CAR TRUCK

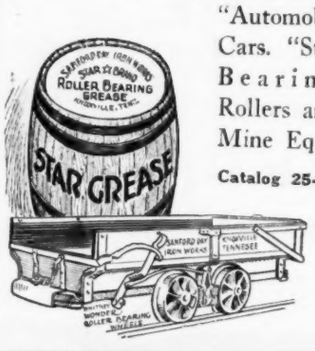
MADE BY
SOUTHERN WHEEL CO.
St. Louis, Mo. Birmingham, Ala.
Send for book "An Easy Running Car by Proper Lubrication"

Kilby Frog & Switch Co.
BIRMINGHAM, ALA.

Manufacturers of Frogs, Switches and Crossings. We make a specialty of track work for Mining and other industrial railways.

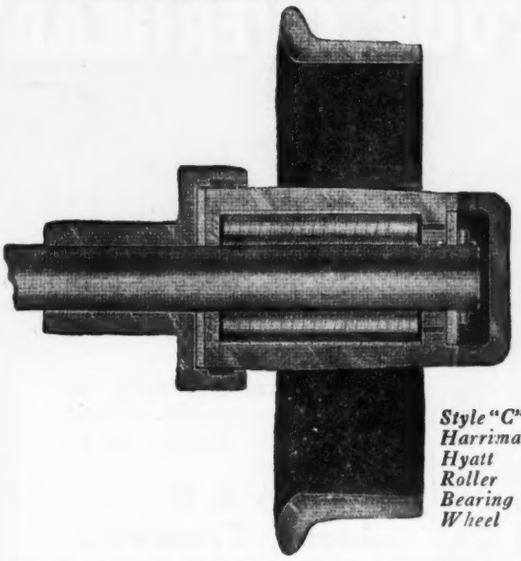
Mr. Sanford-Day can equip you with
"Whitney Wonder" R-B Wheels
"Automobile" Mine Cars. "Star" Roller Bearing Grease. Rollers and Sheaves Mine Equipment.

Catalog 25-D-160 pages



Sanford-Day Iron Works Knoxville, Tenn.

Harriman-Hyatt Trucks



Style "C" Harriman-Hyatt Roller Bearing Wheel

Harriman-Hyatt trucks will cut your haulage costs by a saving of power and lubrication. Then the long life of Harriman-Hyatt trucks is a great factor.

We can furnish trucks to go under your old cars or we can build your cars complete. Our engineers are at your service in solving your haulage problems and we will be glad to submit designs if you will allow us to do so.

We also make the Harriman Sand Drier.

HARRIMAN FOUNDRY AND MACHINE WORKS

Harriman, Tennessee

Representatives in principal mining sections

FLEMING

Self-Aligning Hyatt Roller-Bearing

JOURNAL BOXES

More Than 50,000 In Use

The fact that more than 50,000 Fleming Self-Aligning Hyatt-Roller-Bearing Journal Boxes are already in use; and that some of the largest coal-mining companies have adopted them, is sufficient guarantee as to their money-saving qualities. Details promptly on request.

J. R. Fleming & Sons Co., Inc.
Scranton, Pa.

JOIN
the ever-growing CIRCLE of USERS of MINE CARS equipped with HYATT Bearings

And learn what real mine car economy is!

Many men think it entirely a matter of price — Hyatt users don't agree with them.

It pays to buy good mine cars — Hyatt equipped — from a reputable manufacturer.

Ask your regular supplier for prices on new cars or replacement trucks to-day — Hyatt equipped — of course.

Hyatt Roller Bearing Co.
New York City

D-359

ANACONDA TROLLEY WIRE

ANACONDA COPPER MINING CO.

GENERAL OFFICES
ROLLING MILLS DEPT.
111 W. WASHINGTON ST.
CHICAGO.

YOUR "OVERHEAD"

Overhead haulage reduces your "overhead" materially. No delays, no coal spillage, no expensive upkeep.

B & B Aerial Tramways

mean unhampered haulage in all weathers, under all conditions. Operating our Two-Bucket System is a one-man job throughout. Installation cost low.

Write for Aerial Tramway Book No. 9

BRODERICK & BASCOM ROPE CO. St. Louis
New York Seattle
B43B

FROGS, SWITCHES, PORTABLE TRACK
TURNTABLES INDUSTRIAL CARS CROSSINGS

LIGHT RAILWAY EQUIPMENT CO.
COMMERCIAL TRUST BUILDING PHILADELPHIA PA

The
West Virginia Rail Co.
Manufacturers
Light Steel Rails
and Accessories
12, 16, 20, 25, 30, 35, 40, 45-lbs. per yd.
Huntington, W. Va.

WATERBURY WIRE ROPE

Flexibility and Strength for the Stiffest Requirements

WATERBURY CO. 61 PARK ROW NEW YORK

LIGHT STEEL RAILS

8, 12, 16, 20, 25, 30, 35, 40 lb. per yard
Splices, Spikes, Frogs and Switches

UNITED STATES RAIL CO.
CUMBERLAND, MARYLAND

WIRE ROPE FOR MINING

Write for our catalogue

Established 1857
A. LESCHEN & SONS ROPE COMPANY
St. Louis, U. S. A.
New York Chicago Denver Salt Lake City San Francisco

Advertisements for the

Searchlight Section

Can be received at the New York Office of Coal Age until 11 a.m.

Monday

For Issues out Thursday

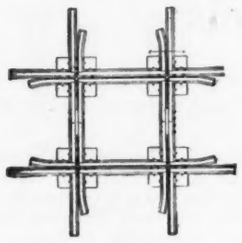
74

ROEBLING

WIRE ROPE AND WIRE

WELDING WIRE WIRE ROPE FITTINGS

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J.



Solid Crossing, Riveted Plate

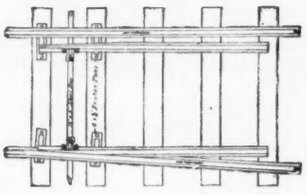
AMERICAN

TRACK EQUIPMENT

It pays well to insist on track equipment that is mechanically correct and constructed true to design. The *American* switching combination shown here—switch, stand and frog, is fool proof. The well balanced and weighted Ground Throw Stand with rigid rod connection won't permit a careless driver to "half-close" a switch point; it's bound to *close tight,* and the switch-point design makes it *fit right.*

Danger to lives of employees and damage to property from inferior track accessories is inexcusable. Try the *American* Brand.

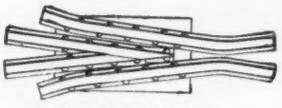
Get the American Bulletins



Split Switch.

American Frog & Switch Co.

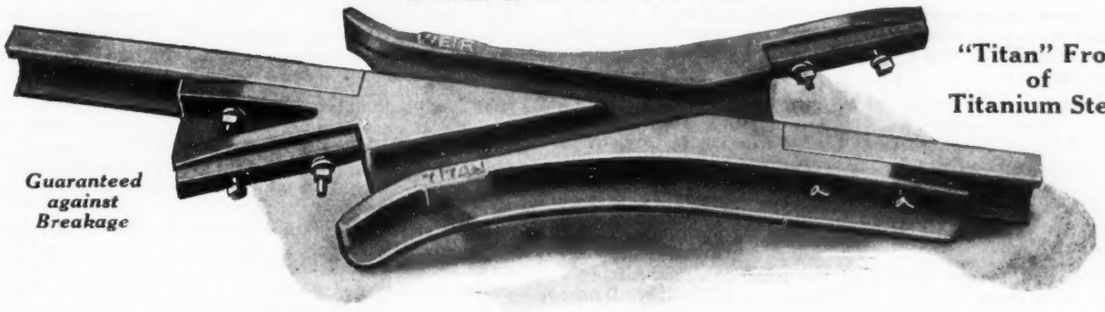
Hamilton, Ohio, U. S. A.



Riveted Plate Frog.

Ground Throw Switch Stand, Rigid Rod.

40 YEARS OF SUCCESSFUL SERVICE



Guaranteed against Breakage

"Titan" Frog of Titanium Steel

Filling Modern Requirements

Maximum production means minimum overhead charges at coal mines just the same as in any other business.

Maximum production at coal mines calls for dependable tracks along the haulageway. Heavy locomotive and loaded cars, running at top speed, have no terrors for the Weir "Titan" Frog. It is made of titanium treated steel, cast in one piece, and is guaranteed against breakage and to outlast any cast-iron or semi-steel frog a dozen times over.

The Weir "Titan Frog is built to stand up under modern mine haulage requirements.

Write for details and prices.

Established 1882

WEIR FROG COMPANY

Largest and oldest company in the United States making a specialty of track work for mines. Complete turnouts for rooms, tram roads and tipples. Prompt shipments, durable work and reasonable prices. Our Engineering Force is at your service

CINCINNATI, OHIO

The Slaughter of the Innocents

WHEN JESUS CHRIST came upon the earth, nearly two thousand years ago, to save all mankind, his mere coming seemed to interfere with the material interests of a few people of that period, notably King Herod, who promptly decided to dispose of this "interloper," and sent forth his soldiers with orders to slay all the children of two years old and under. Thus was consummated the most atrocious crime against innocent childhood ever committed up to that time. It has come down to us through all the ages in song and story, and master painters have pictured it on marvelous canvases.

To-day passing in review, as we look out through the windows of our comfortable homes in this great and happy land, are three and a half millions of helpless children, the innocent victims of the greatest war that has ever afflicted humanity. It matters not, as we gaze in the direction of these children, that our eyes must stretch across three thousand miles of ocean, we still can see them and we still can hear them, if we wish to do so; and we can not help hearing the tragic appeal in their voices and seeing their tiny arms stretched out to us, and their searching eyes looking into our souls, as they say, "Help us, or we perish." And if we fail to listen to this great call of three and a half millions of God's helpless children; if we close our eyes and ears to this great demand of **duty**, we will be just as guilty of the "slaughter of the innocents" as was Herod, nearly two thousand years ago.

In these lands, swept by death and filled with tragedies too deep for tears, a sum of human suffering is being written greater perhaps than for all ages gone by. The mind grows numb and the heart sick from a constant recital of tales of such tragedy as it is difficult to believe the twentieth century could hold.

And so, when the call for help came from Mr. Hoover telling that America must not allow hunger and cold to return to this mass of 3,500,000 helpless children the soul of America was stirred and the hot blood surged up in our hearts. It is our imperative duty to use all the power God has given us to aid this noble-hearted American in continuing the work of saving human lives to which he has devoted unsparingly, and at great personal sacrifice, his tremendous energy and administrative genius during the past six years, in which time he and his American colleagues have administered two billions of dollars of relief funds from all parts of the world with a total overhead expense of only three-eighths of one percent., without any remuneration to the American directors. Now he asks us all to help save the children who are in imminent danger of starvation this coming winter.

There they are, in the midst of wrecked homes, and farms, and factories; in cities crowded with masses of refugees without sustaining food for children, through the destruction of live stock; seeds for planting, raw materials, tools, and machinery gone; great areas with everything burned, or looted, or smashed; vast unemployment for workers; no means of subsistence; a land of economic ruin, of mutilated life, and lingering death; and in the midst of it all —the little children.

In long lines they are waiting at the American food-kitchens. Will the food be there for them? Will they be turned away? There are no happy, healthy faces in those long lines—not one. You have seen rags and barefooted children, but never so many little boys and girls literally drest in tatters. They are facing a winter of devastating cold, and for those bare little feet and legs and arms there is nothing at home to put on.

Hollow faces and shrunken bodies are so common that their real conditions does not become evident until we inquire more closely, and then we find that most of them are from one to five years back in their growth. Children of eight years old have not reached the normal size of two and a half. They are just learning to stand alone. Others almost as old can not yet stand on their feet. Their arms, and legs, and spines, and chests are twisted and warped. The flesh and skin are shriveled on their bones. It is surprising that life can still exist there. If they can have food they will gradually regain their health and strength, but with most of them it is a question of now or never. Starvation and tuberculosis will not wait.

In Poland alone a million five hundred thousand such children must be cared for. In Latvia and Esthonia the people are living mostly on a diet made from potato-flour, oat-flour, and sawdust. In Czecho-Slovakia, in Hungary, in Austria, and in other countries of central and southeastern Europe, two millions more are n dire need of food; and who stops to ask regarding creed, or race, or nationality when a little child is starving? Children are just children the world over, and the great American heart is big enough to care for them all.

But the appeal now is not for all. The three and a half millions of children in immediate danger of starvation, if this organization fails, who *must* have food at once, are only a fraction of the total number. The hungry children of those destitute countries have been examined by competent physicians, and only those whose wasted little bodies are reduced to the minimum weight, and whose endurance of hunger has reached the end which merges into actual starvation, are admitted to the American kitchens and given *one meal a day*. It is hard to turn away thousands of hungry boys and girls—to hear them ask, pleadingly, "Do I weigh too much?" "Am I not thin enough?" "Can't I come any more?" But this restricting of food to the extreme cases is compulsory, because there isn't enough for all.

And these neediest ones can not reach the kitchens through the cold winds and the snow barefooted and in the pitiful rags which form only a partial covering for their bodies. They must have clothes. Each outfit consists of one pair of warm woolen stockings, one pair of boots, and a little overcoat. This one meal a day, and these boots, stockings, and little coat can be supplied *only if we give them*. If we do not, the slaughter of the innocents by cold and starvation will be appalling.

Among those who will read this page there is not one—there can not be a single one—whose heart will not respond gladly and eagerly to the challenge of this great need. We are asking *you* to cooperate with Mr. Hoover in raising twenty-three million dollars to feed and clothe these children and save them from death this winter. It can be done. It shall be done! This publication knows its readers and the deep earnestness, the quick sympathy, the great-hearted generosity they always show when any real human need calls to them. You have never been called upon in vain. We are counting on you now with a great confidence. We know, also, how truly you represent the American spirit, which beats in the hearts of over a hundred million people in this big land of plenty, a spirit which leaps ready at every such call, and is never weary in well-doing. We are not a hermit nation, isolated from the world, when suffering and want cry out to us from anywhere under the sun. A great, a beautiful, and heart-sustaining hope supports these stricken people—*America will come to their relief*. For in the far places of the earth, where famine stalks, one name and one alone is synonymous with rescue and hope—and that name is America.

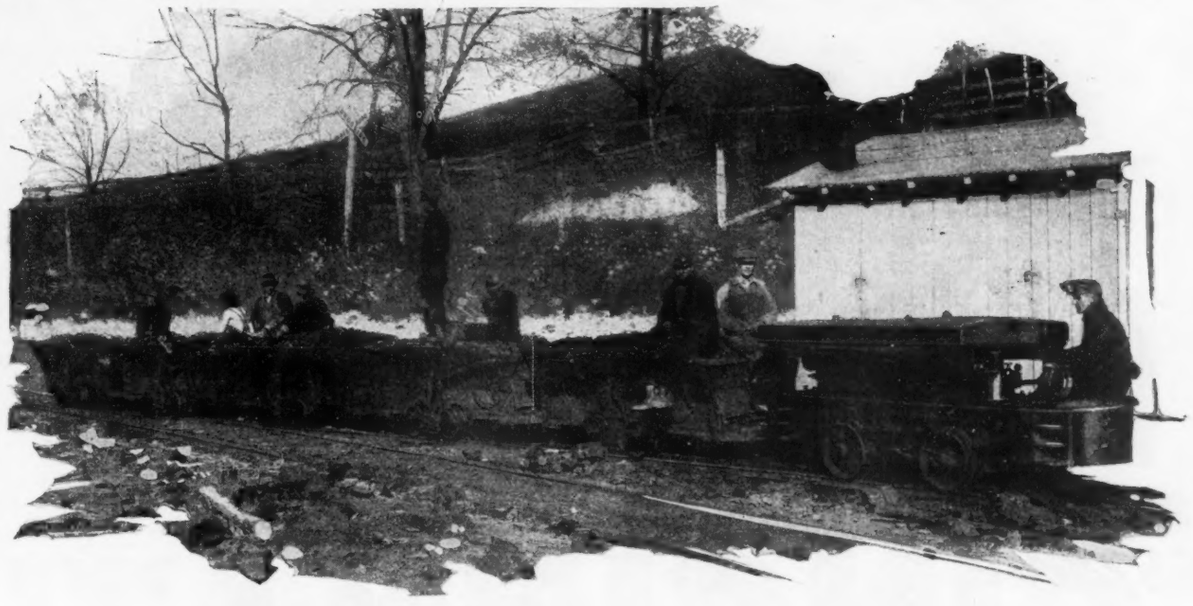
The small individual unit of ten dollars will provide the coat and boots and stockings and one meal a day for one child this winter. We urge our readers—we urge *every one* whose eyes are on these words—to give quickly as many of these units as possible, to buy **for themselves that precious and priceless thing, the live of a little child**—as many of them as they can, and everyone will be a shining star in an eternal crown. It was the Divine Lover of little children, who came to earth as a little child, and who reigns now as the King of Glory, who said, "Inasmuch as ye have done it unto one of the least of these, ye have done it unto me." He does not forget, nor fail to reward.

Mr. Hoover, Chairman of the European Relief Council which has been organized to spread this great need before the American people, is asking twenty-three millions to save the lives of these little innocent children who are facing death. This European Relief Council includes among its workers the following organizations—American Friends' Service Committee (Quakers), American Relief Administration, Jewish Joint Distribution Committee, American Red Cross, Knights of Columbus, Federal Council of Churches of Christ in America, Y. M. C. A. and the Y. W. C. A. These organizations, led by Mr. Hoover, are banded together in this great cause for humanity to redeem the little lives and save the terrible toll of tiny graves by the hundred thousand.

Let us all see again what the Father's heart is like in this great rich land of America. Let us spring to the rescue, as true Americans always have done, and contribute to the extent of our hearts—for never was a need more urgent or help wanted more quickly.

Make your check payable to Franklin K. Lane, Treasurer, and mail it to the European Relief Council, 42 Broadway, New York City. Every dollar will go toward the purpose for which you give it without one penny deducted. Give, and give *now*.

PLYMOUTH
Gasoline Locomotives



Moves 400 Tons of Coal Daily

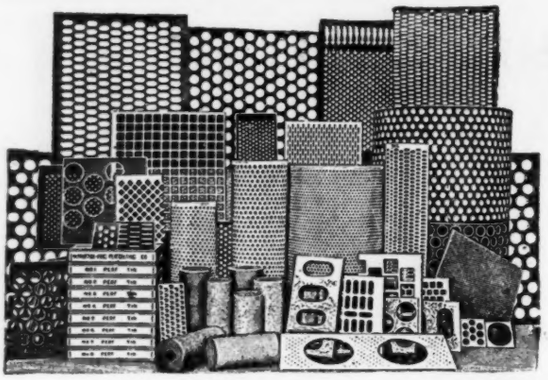
C. M. Wolf, superintendent of the Morrell Coal Company writes: "Skilled labor is unnessary to operate your Plymouth Gasoline Locomotive. It picks up a heavier load more quickly and easily than any other system I have found. We pull a heavier load than is understood to be possible, due to the Plymouth's full power at slow speed.

In coal, iron or zinc mines, or wherever earth or mineral demand big haulage, the Plymouth is complete master, with increased tonnage at lower cost and fewer men. Whether underground or on the surface, it multiplies production and profit.

Write for special bulletin on Plymouth service in mines.

THE FATE-ROOT-HEATH CO., Plymouth, Ohio

PLYMOUTH
Gasoline Locomotives



Perforated Steel Screen Plates

For Coal and Coke, Crushed Stone, Phosphate Rock, Gravel, Sand, etc.

¶ Cylindrical Screen sections rolled to diameter, lap or butt joints, and fastened with clips, bolted or riveted—segments for Taper Screens rolled to diameter with bolt holes in margins.

¶ Flat screen plates of any dimensions to 10 x 20 feet to one inch thick for heavy work.

¶ Standard size of Round, Oblong and Square holes—special sizes made to suit.

¶ Manganese Bronze or Monel Metal Screens for acidulated or sulphurous mine waters.

¶ Our sizes are standard centers (distance apart) but we can give you closer or wider spacing if required—in other words *you get what you want.*

¶ The screens are made with care, exact to details of size, thickness and dimensions—in point of material and workmanship the best of their kind. *Please send detail specifications with your order or inquiry.*

THE HARRINGTON & KING PERFORATING CO.

628 NORTH UNION AVE. CHICAGO, ILL, U. S. A.

NEW YORK OFFICE, 114 LIBERTY ST.

"CINCINNATI"

TRACK EQUIPMENT

"Depend Upon It" for Endurance

It's an old saying that you get as much out of a thing as you put into it. Building track equipment is our business and every ounce of our energy is devoted to producing an article of superior quality.
Lugs used on all our standard switches are of heavy die formed steel and illustrated herewith.

The "Cincinnati" Frog & Switch Company

Established 1906

Cincinnati, Ohio

REPRESENTATIVES: Mr. Herbert Crapster, 1 Madison Ave., New York, N. Y.; Mr. F. R. Holmsted, Charleston, W. Va.; The United Railway Supply Co., Birmingham, Ala.; Mine Safety & Service Co., Benton, Ill.

FROGS - CROSSINGS - SWITCH STANDS - SWITCHES - ROOM TURNOUTS - ETC.

WHAT AND WHERE TO BUY

A Classified Index of Advertisers in This Issue

For Alphabetical Index See Last Page

Acetylene Apparatus
Chicago Pneumatic Tool Co.

Air, Aftercoolers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Air, Receivers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Armature Repair Machinery
Electric Service Supplies Co.

Armatures and Field Coils
Chattanooga Armature Works
Westinghouse Elec. & Mfg. Co.

Asbestos Materials
Keasbey & Mattison Co.

Ash Handling Machinery
Link-Belt Co.

Augers, Coal (See Drills)

Battery Boxes
Paragon Electric Co.

Battery Charging Equipment
Cutler-Hammer Mfg. Co.

Bearings, Ball and Roller
Enterprise Fdry. & Mach. Wks.
Hyatt Roller Bearing Co.

Bearings Roller, Journal Boxes for,
Fleming & Sons Co., Inc., J. F.

Belt Dressing
Keystone Lubricating Co.

Belts, Conveyor
Goodrich Rubber Co., B. F.
Link-Belt Co.
N. Y. Belting & Packing Co.

Belts, Elevator
Goodrich Rubber Co., B. F.
N. Y. Belting & Packing Co.

Belts, Transmission
Goodrich Rubber Co., B. F.
Link-Belt Co.
N. Y. Belting & Packing Co.

Bit Sharpeners
Ingersoll-Rand Co.
Kaukauna Machine Works
Little Giant Co.
Sullivan Machinery Co.

Blowers
Buckeye Blower Co.
Stine, S. B.

Blowers, Centrifugal
Ingersoll-Rand Co.

Boilers Horizontal, Return Tubular
Casey-Hedges Co., The

Boilers, Water Tube
Babcock & Wilcox Co.
Casey-Hedges Co., The
Wickes Boiler Co., The

Books, Coupon
Allison Coupon Co.

Bonding Machines
Electric Railway Improvement Co.

Books, Technical
McGraw-Hill Co., Inc.

Boosters, Air
Ingersoll-Rand Co.

Boots and Shoes
Goodrich Rubber Co., B. F.

Box Car Loaders
Fairmont Mining Machinery Co.
Link-Belt Co.

Brattice, Cloth
Fulton Bag & Cotton Mills

Brattice Cloth Insulation
Mikesell Brothers Co.

Breaker Machinery
Vulcan Iron Works
Wilmot Engineering Co.

Breakers, Circuit, Electric
Automatic Reclosing Circuit Breaker Co., The
Bartlett & Snow Co., The C. O.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Brakes, Electrically Operated
Cutler-Hammer Mfg. Co.

Briquetting Machinery
General Briquetting Co.
Malcolmson Briquet Engr. Co.

Buckets, Clamshell
Link-Belt Co.

Buckets, Coal Handling
Fairmount Mining Machinery Co.
Link-Belt Co.

Buckets, Elevator
Bartlett & Snow Co., The C. O.
Hendrick Mfg. Co.
Link-Belt Co.

Cableways
Broderick & Bascom Rope Co.
Flory Mfg. Co., S.

Cages
Fairmount Mining Machinery Co.
Helmick Foundry-Machine Co.
Morrow Mfg. Co.
Ottumwa Iron Works
United Iron Wks., Inc.

Cagers
Mining Safety Device Co.

Cagers, Automatic
Holmes & Bros. Inc., Robt.
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.

Car Hauls
Fairmont Mining Machinery Co.
Jeffrey Mfg. Co., The
Link-Belt Co.
Webster Mfg. Co.

Car Hitchings
Pittsburgh Knife & Forge Co.

Car Loaders
Portable Machinery Co.
Webster Mfg. Co.

Car Stops, Automatic
Fairmount Mining Machinery Co.
Hyatt Roller Bearing Co.
Mining Safety Device Co
Phillips Mine & Mill Supply Co.

Cars and Car Wheels
Atlas Car & Mfg. Co.
Enterprise Fdry. & Mach. Wks.
Fairmont Mining Machinery Co.
Harriman Foundry & Machine Works.
Helmick Foundry-Machine Co.
Hockensmith Wheel & Mine Car Co.
Irwin Foundry & Mine Car Co.
Koppel Industrial Car & Equip. Co.
Lobdell Car Wheel Co.
Ottumwa Iron Works.
Phillips Mine & Mill Supply Co
Sanford-Day Iron Works
Southern Wheel Co.
Stine, S. B.
United Iron Wks., Inc.
Watt Mining Car Wheel Co.

Cars, Mine Air Compressor
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Cars, Roller Bearing Journal Boxes For
Flemings & Sons Mfg. Co., Inc., J. F.

Cars, Steel Mining
Hendrick Mfg. Co.

Castings
Fairmont Mining Machinery Co.
Falk Co.
Flood City Mfg. Co.
Hockensmith Wheel & Mine Car Co.
Lobdell Car Wheel Co.
Sanford-Day Iron Works

Castings, Iron, Brass or Bronze
Fairmount Mining Machinery Co.

Chain Flight Conveyors
Jeffrey Mfg. Co., The

Chains
Fairmount Mining Machinery Co.
Link-Belt Co.

Chutes
Fairmount Mining Machinery Co.
Helmick Foundry-Machine Co.
Phillips Mine & Mill Supply Co.
Sanford-Day Iron Works
Webster Mfg. Co.

Clutches, Friction
Caldwell & Co., Inc., W. E.
Link-Belt Co.

Coal
Bertha Coal Co.

Coal and Ash Handling Machinery
Holmes & Bros., Inc., Robt.
Link-Belt Co.
Portable Machinery Co.

Coal Buyers
Cory-Mann George Corp., Wm.

Coal Driers
Elmore, G. H.

Coal Drills, Electric and Pneumatic
Chicago Pneumatic Tool Co.

Coal Exporters
Cory-Mann George Corp., Wm.

Coal Mining Plants
Fairbanks-Morse & Co.
Jeffrey Mfg. Co., The
Link-Belt Co.

Coalometers
Thornley & Co., Inc., F. C.

Coal Storage and Rehandling Machinery
Jeffrey Mfg. Co., The
Link-Belt Co.
Phillips Mine & Mill Supply Co.
Webster Mfg. Co.

Coke Oven Drawing and Leveling Machines
Atlas Car & Mfg. Co.

Commissary Equipment
Automatic Refrigerating Co., The

Commutators
Chattanooga Armature Works.

Compressors, Air
Fairbanks-Morse & Co.
General Electric Co.
Penn Pump & Compressor Co.
Sullivan Machinery Co
Worthington Pump & Mchry. Corp.

Compressors, Gas
Ingersoll-Rand Co.
Penn Pump & Compressor Co.
Worthington Pump & Mchy. Corp.

Concentrators, Magnetic
Dings Magnetic Separator Co.

Concrete Construction
Cement-Gun Co., Inc.

Concrete Finishing Tools
Cement-Gun Co., Inc.

Concrete Mixers
Diamond Machine Co.

Condensers
Manistee Iron Works Co.

Condensers, Low Level Jet
Ingersoll-Rand Co.

Condensers, Rotary Jet
Manistee Iron Works Co.

Condensers, Surface
Ingersoll-Rand Co.
Worthington Pump & Mchry. Corp.

Condulets
Crouse-Hinds Co.

Connectors
Westinghouse Elec. & Mfg. Co.

Consulting Engineers (See Alphabetical Index)

Controllers
Cutler-Hammer Mfg. Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Conveyors, Cable Flight
Fairmount Mining Machinery Co.
Jeffrey Mfg. Co., The

Conveyors, Chain Flight
Cross Engineering Co.
Link-Belt Co.
Bartlett & Snow Co., The C. O.

Conveyors, Coal
Fairmont Mining Machinery Co.
Jeffrey Mfg. Co., The
Hendrick Mfg. Co.
Link-Belt Co.
Marion Mch. Fdry. & Supply Co.
Portable Machinery Co.
Robins Conveying Belt Co.
Webster Mfg. Co.

Conveyors, Magnetic
Dings Magnetic Separator Co.

Couplings, Flexible
Dexter Co., I. H.

Couplings Mine Car
Fairmont Mining Machinery Co.
Hockensmith Wheel & Mine Car Co.

Cranes
Ball Engine Co.
Bucyrus Co.
Link-Belt Co.

Crossings (See Switches, Frogs and Crossings)

Crushers, Coal
American Pulverizer Co.
Bartlett & Snow Co., The C. O.
Jeffrey Mfg. Co., The
Link-Belt Co.
Marion Mch. Fdry. & Supply Co.
Pennsylvania Crusher Co.
Stedman's Foundry & Mch. Wks
Traylor Engineering & Mfg. Co.
Vulcan Iron Works
Webster Mfg. Co.
Williams Pat. Crusher & Pulv. Co.

Crusher Protectors
Dings Magnetic Separator Co.

Crushing Plants, Coke
Webster Mfg. Co.

Cut-Outs, Electric
Crouse-Hinds Co.

Dealers' Machinery
Carlin Mach. Co., John H.
Carrell, W. A.
Chicago Electric Co.
Cohen & Son, Louis
Continental Iron & Steel Co.
Donahoo Co.
Duquesne Elec. Mfg. Co.
Eicher, H. R.
Empire Eng. & Equip Co.
Fuller Steel & Iron Co.
Frank, M. K.
Green, L. A.
Gregory Elect. Co.
Griffith, J. A.
Independent Elect. & Machy Co.
Iron Trade Products Co.
Harris Bros. Co.
Hyman Michaels Co.
Lambert Co., H. T.
MacGovern & Co.
Mid-Continent & Equip. Co.
Miller-Owen Co.
Mining & Equip. Supply Co.
Moorhead Machy. Co.
Norton-Broadway Machy. Co.
Penn Elect. Co.
Pittsburgh Boiler Mach. Co.
Power Equip. Co.
Power Machy. Exchange
Sherwood, E. C.
Scheinert Co., R.
Standard Rail & Steel Co.
Ross Power Equip. Co.
Reading Engrg. Co.
Richmond Mill & Supply Co
Wickes Machy. Co.
Wilson Co., E. H.
Zelnicker Supply Co.

Diamond Core Drill, Contracting
Diamond Drilling & Exploration Co.
Hoffman Bros.
Pennsylvania Drilling Co.
Punxsutawney Drill & Cont. Co.
Sullivan Machinery Co.

Doors, Automatic Mine (See Mine Doors, Automatic)

Drafting Materials (See Eng. Instruments and Supplies)

Dredges
Bucyrus Co.
Marion Steam Shovel Co., The

Driers, Sand
Electric Service Supplies Co.
Harriman Foundry & Machine Works

Drills, Air
Chicago Pneumatic Tool Co.
Pittsburgh Boiler & Mach. Co.
Sullivan Machinery Co.
Whitcomb Co., Geo. D.

Drills, Core
Chicago Pneumatic Tool Co.
Sullivan Machinery Co.

Drills, Electric
Chicago Pneumatic Tool Co.
Fairmount Mining Machinery Co.
Jeffrey Mfg. Co.
Sullivan Machinery Co.

Drills, Portable Electric
General Electric Co.

Drills, Power
Chicago Pneumatic Tool Co.
Fairmont Mining Machinery Co.

Drills, Rock
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Ingersoll-Rand Co.

Drives, Silent Chain
Link-Belt Co.

Drums, Magnetic
Dings Magnetic Separator Co.

Dump Protectors
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.

Dumps, Cross-Over
Fairmont Mining Machinery Co.
Helmick Foundry-Machine Co.
Sanford-Day Iron Works
United Iron Wks. Inc.

Dumpers, Rotary
Fairmount Mining Machinery Co.

Dynamos (See Generators)
Westinghouse Elec. & Mfg. Co.

Electric Haulage Supplies
Electric Service Supplies Co.

Electrical Supplies
Crouse-Hinds Co.

Elevators and Conveyors
Fairmount Mining Machinery Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Webster Mfg. Co.

Engineering Instruments and Supplies
Buff & Buff Mfg. Co.

Engineering & Technical Books
McGraw-Hill Book Co., Inc.

Engines
Midwest Engine Co.

Engines, Gasoline
Fairbanks-Morse & Co.

Engines, Hoist and Haulage
Holmes & Bros. Inc., Robt.
Vulcan Iron Warks

Engines, Oil
Chicago Pneumatic Tool Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Midwest Engine Co.
Miller-Owen Elec. Co.

Engines, Steam
Ball Engine Co.
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Excavating Machinery
Ball Engine Co.
Bucyrus Co.
Marion Steam Shovel Co., The

Eye Protectors
Willson Goggles Inc.

Fans, Ventilating
Buckeye Blower Co.
Jeffrey Mfg. Co.
Stine, S. B.
Vulcan Iron Works

Feeders, Apron & Oscillating
Fairmont Mining Machinery Co.

Feeders, Automatic
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.

Filters, Water
Permutit Co., The
Fairbanks, Morse & Co.

Filtration Systems
Permutit Co.

Fittings, Wire Rope (See Rope Wire)

Floodlights, Portable
Crouse-Hinds Co.
General Electric Co.

Gage Cocks
Lunkenheimer Co., The
Ohio Brass Co., The

Gages, Water, Boiler and Locomotive
Crane Co.
Jenkins Bros.
Lunkenheimer Co., The
Ohio Brass Co., The

Gaskets
Garlock Packing Co.
N. Y. Belting & Packing Co.

Gear Cases
Electric Service Supplies Co.

Gears
Falk Co.
Medart Patent Pulley Co.
Vulcan Iron Works

Generators and Generating Units
Fairbanks-Morse & Co.
General Electric Co.
Terry Steam Turbine Co.
Westinghouse Elec. & Mfg. Co.

Glasses, Safety
Willson Goggles Inc.

Goggles, Industrial
Willson Goggles Inc.

Grates, Traveling
Combustion Engineering Corp.

Greases
Keystone Lubricating Co.
Sanford-Day Iron Works
Standard Oil Co.

Grinders, Portable
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Guy Anchors
Crouse-Hinds Co.

Hammers, Power
Kaukauna Machine Works
Little Giant Co.
Sullivan Machinery Co.

Hangers (See Pulleys)

Headlights, Arc & Incandescent
Crouse-Hinds Co.

Headlights, Locomotive
Electric Service Supplies Co.
General Electric Co.

Heaters, Air Electric
Cutler-Hammer Mfg. Co., The

High Explosives (See Dynamite)

Hoists, Dock
Flory Mfg. Co., S.

Hoists, Electric
Diamond Machine Co.
Fairbanks-Morse & Co.
Flory Mfg. Co., S.
Holmes & Bros., Inc., Robt.
Link-Belt Co.
Ottumwa Iron Works
Thomas Elevator Co.
Vulcan Iron Works
Wellman-Seaver Morgan Co.

Hoists, Portable
Chicago Pneumatic Tool Co.
Flood City Mfg. Co.
Ingersoll-Rand Co.

Hoists, Skip
Bartlett & Snow Co., The C. O.

Hoists, Steam
Flory Mfg. Co., S.
Ingersoll-Rand Co.
Ottumwa Iron Works
Sullivan Machinery Co.
Thomas Elevator Co.
Vulcan Iron Works
Wellman-Seaver-Morgan Co.

Hose
N. Y. Belting & Packing Co.

Hose, Air
Chicago Pneumatic Tool Co.
Denver Rock Drill Mfg. Co.
Goodrich Rubber Co., B. F.
N. Y. Belting & Packing Co.

Hose, Steam
N. Y. Belting & Packing Co.

Hose Water
N. Y. Belting & Packing Co.

Incline Plane Machinery
Fairmont Mining Machinery Co.
Sanford-Day Iron Works
Stine, S. B.

Injectors and Ejectors
Crane Co.
Jenkins Bros.
Lunkenheimer Co., The
Westinghouse Elec. & Mfg. Co.

Insulators, Section
Electric Railway Equipment Co.
Flood City Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Irons, Soldering
Cutler-Hammer Mfg. Co., The

Jig Controllers, Automatic
Elmore, G. H.

Jigs
Elmore, G. H.
Traylor Engineering & Mfg. Co.
Webster Mfg. Co.

Journal Boxes, Roller Bearing or Plain Bored
Fleming & Sons Mfg. Co., Inc., J. R.

Knife Switches
Crouse-Hinds Co.

Lamps Arc & Incandescent
General Electric Co.

Larries, Coke Oven
Fairmont Mining Machinery Co.
Phillips Mine & Mill Supply Co.

Lightning Arresters
Electric Service Supplies Co.

Loaders, Box Car (See Box Car Loaders)

Loaders, Coal
Lake Superior Loader Co., The

Loaders, Wagon and Truck
Diamond Machine Co.
Jeffrey Mfg. Co.
Link-Belt Co.

Loading Booms
Fairmont Mining Machinery Co.
Jeffrey Mfg. Co.
Morrow Mfg. Co.
Webster Mfg. Co.

Lockers, Steel
Medart Mfg. Co., Fred.

Locomotives, Compressed Air
Porter Co., H. K.
Vulcan Iron Works

Locomotives, Electric
Atlas Car & Mfg. Co.
General Electric Co.
Jeffrey Mfg. Co.
Lima Locomotive Wks., Inc.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline
Hadfield-Penfield Steel Co.
Vulcan Iron Works
Whitcomb Co., Geo. D.

Locomotives, Steam
Porter Co., H. K.
Vulcan Iron Works

Locomotives, Storage Battery
Atlas Car & Mfg. Co.
General Electric Co.
Jeffrey Mfg. Co.
Mancha Storage Battery Locomotive Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Co., Geo. D.

Lubricants
Standard Oil Co.
Texas Co.

Lubricators
Keystone Lubricating Co.
Lunkenheimer Co., The

Machine Tools
Standard Oil Co.

Machines, Shoveling
Lake Superior Loader Co.

Magnetic Drums
Dings Magnetic Separator Co.

Magnets, Electro
Dings Magnetic Separator Co.

Magnetics, High Intensity
Dings Magnetic Separator Co.

Magnetics, Standard Specials
Dings Magnetic Separator Co.

Mechanical Draft Apparatus
Buckeye Blower Co., The
General Electric Co.

Mine Doors, Automatic
American Mine Door Co., The

Mineral Magnetic Separators
Dings Magnetic Separator Co.

Mining Machines
Sullivan Machinery Co.
Whitcomb Co., Geo. D.

Mining Machines, Chair and Puncher
Jeffrey Mfg. Co.

Motor Starters
Cutler-Hammer Mfg. Co.

Motors
Fairbanks-Morse & Co.
General Electric Co.
Wesche Electric Co., B. A.
Westinghouse Elec. & Mfg. Co.

Oil & Grease Cups
Keystone Lubricating Co.

Oiling Devices
Lunkenheimer Co., The

Ore Separators
Dings Magnetic Separator Co.

Packing
Garlock Packing Co., The
Goodrich Rubber Co., B. F.
N. Y. Belting & Packing Co.

Paint, House
Detroit Graphite Co.

Paint, Interior
Detroit Graphite Co.

Paint, Preservative
Detroit Graphite Co.

Panelboards
Crouse-Hinds Co.

Perforated Metals
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

Picking Tables
Bartlett & Snow Co., The C. O.
Fairmont Mining Machinery Co.
Jeffrey Mfg. Co., The
Link-Belt Co.
Morrow Mfg. Co.
Webster Mfg. Co.

Pile Drivers, Locomotive
Bucyrus Co.

Pipe
Michigan Pipe Co.

Pipe Cutting and Threading Machinery
Toledo Pipe Threading Mach. Co.

Pipe, Spiral Riveted
Abendroth & Root Mfg. Co.

Pipe, Wood
Wyckoff & Son Co., A.

Playground Apparatus
Medart Mfg. Co., Fred

Power Transmission Machinery
Caldwell Co., Inc., W. E.

Projectors Supplies
Crouse-Hinds Co.

Pulleys, Magnetic
Dings Magnetic Separator Co.

Pulleys, Shafting and Hangers
Caldwell & Co., Inc., W. E.
Electric Railway Equipment Co.
General Electric Co.
Medart Patent Pulley Co.

Pulverizers, Coal and Coke
American Pulverizer Co.
Jeffrey Mfg., The
William Pat. Crusher & Pulv Co.

Pump Plungers
Lobdell Car Wheel Co.

Pump Valves
N. Y. Belting & Packing Co.

Pumping Machinery
Penn Pump & Compressor Co.

Pumps, Air Driven
McGowan Co., J. H.

Pumps, Boiler Feed
Barrett, Haentjens & Co.
Dean Bros. Steam Pump Works
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
McGowan Co., J. H.
Terry Steam Turbine Co.
Weinman Pump Mfg. Co.

Pumps, Centrifugal
Barrett, Haentjens & Co.
Cameron Steam Pump Wks., A. S.
Elmore, G. H.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
McGowan Co., J. H.
Manistee Iron Works Co.
Midwest Engine Co.
Morris Machine Works
Penn Pump & Compressor Co.
Stine, S. B.
Terry Steam Turbine Co.
Weinman Pump Mfg. Co.

Pumps, Dredging and Sand
McGowan Co., J. H.

Pumps, Mine
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Weinman Pump Mfg. Co.

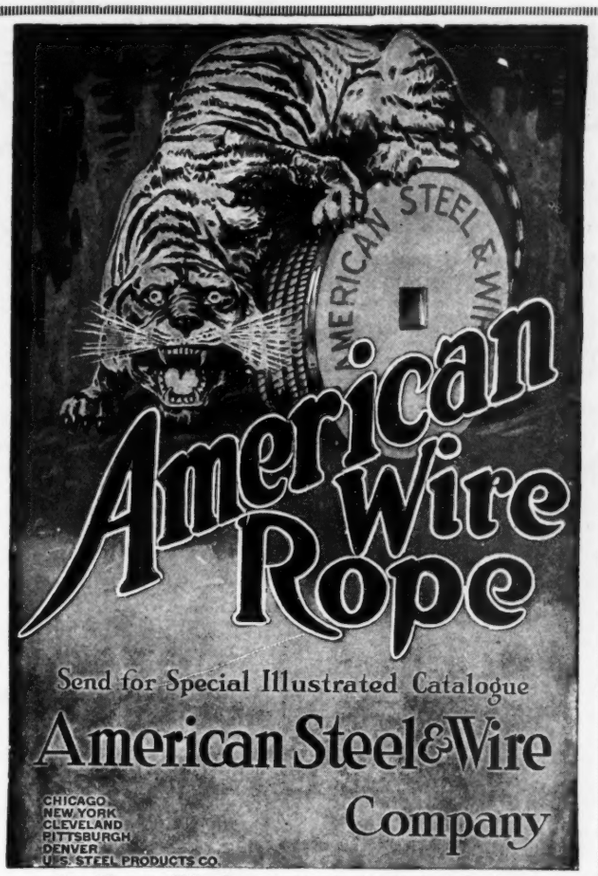
Pumps, Pneumatic Air Lift
Cameron Steam Pump Wks., A. S.
Ingersoll-Rand Co.

Pumps, Power
Boyts, Porter & Co.
Dean Bros. Steam Pump Works
Fairbanks-Morse & Co.
Fairmont Mining Machinery Co.
McGowan Co., J. H.
Morris Machine Works
Weinman Pump Mfg. Co.

Pumps, Sinking
McGowan Co., J. H.

Pumps, Steam
Fairbanks-Morse & Co.
McGowan Co., J. H.
Penn. Pump & Compressor Co.
Weinman Pump Mfg. Co.

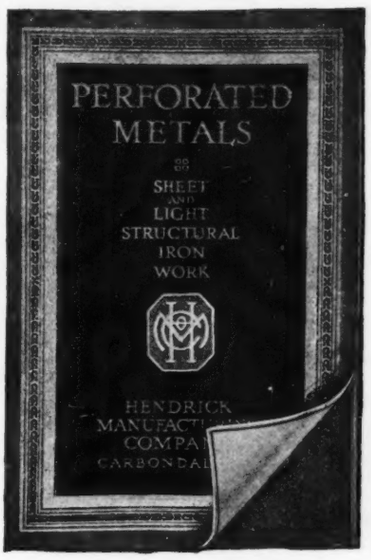
Pumps, Vacuum
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Manistee Iron Works Co.
Weinman Pump Mfg. Co.



Our Offices in Wilkes-Barre are in the Miners Bank Building.

Perforated Metal Screens

For Coal, Coke, Ore, Etc.



Perforated Metal Hand Book

Write for your copy of The **Perforated Metal Hand Book.** It contains valuable information for the user of screens

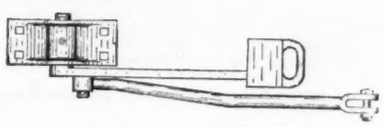
Elevator Buckets

in all styles and sizes General Sheet and Light Structural Work

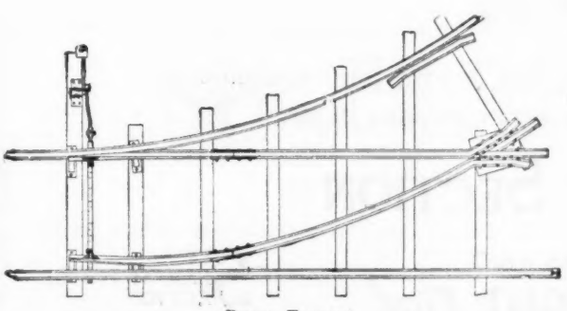
HENDRICK MFG. CO.

53 Dundaff Street, Carbondale, Pa.

CENTRAL
MINE TRACK EQUIPMENT



Switch Stand with Rigid Connecting Rod



Room Turnout

Production

The great danger of a half open switch-point is precluded in "Central" designs.

The well balanced and strongly constructed stand, connecting rod and switch rails assure a combination that is absolutely positive in its operation.

Central" Track Equipment is designed by Track Specialists for coal miners. It is not merely adapted to the work.

Call "Central" and ask for complete information

The Central Frog & Switch Co.

Cincinnati, Ohio

Racks and Bins, Steel
Medart Mfg. Co., Fred.

Rail Bonds
American Steel & Wire Co.
Electric R'way Improvement Co.
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co., The
Westinghouse Elec. & Mfg. Co.

Rails and Rail Joints
Koppel Industrial Car & Equip. Co.
U. S. Rail Co.
West Virginia Rail Co.

Refrigeration, Automatic for Coal Mine Stores
Automatic Refrigerating Co., The

Repairs, Machinery
Jones, G. M.
Crescent Elect. & Mfg. Co.

Respirators
Goodrich Rubber Co., B. F.

Retarders, Railroad Car
Fairmont Mining Machinery Co.

Road Graders
Ball Engine Co.

Roofing
American Sheet & Tin Plate Co.
Keasbey & Mattison Co.

Rope, Manila and Jute
Broderick & Bascom Rope Co.
Waterbury Co.

Rope Transmission
Broderick & Bascom Rope Co.
Columbian Rope Co.

Rope, Wire
Broderick & Bascom Rope Co.
Hazard Mfg. Co.
Leschen & Sons Rope Co., A.
Moon Co., Geo. C.
Roebling's Sons Co., J. A.
Waterbury Co.
Webster Mfg. Co.

Safety Appliances
Mining Safety Device Co.

Safety Magnets
Dings Magnetic Separator Co.

Scales
Fairbanks-Morse & Co.
Streeter-Amet Weighing & Recording Co.

School and Colleges (See Consulting Engrs. Directory)

Scraper Loaders
Diamond Machine Co.

Screens and Perforated Sheeting
Chicago Perforating Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co., The
Marion Mch Fdry. & Supply Co.
Morrow Mfg. Co.
Pittsburgh Perforating Co.
Stimpson Equipment Co.
Tyler Co., The W. S.
United Iron Wks., Inc.

Searchlights
Crouse-Hinds Co.

Second-Hand Equipment (See Searchlight Section)
Carlin Mach. Co., John H.
Carrell, W. A.
Chicago Electric Co.
Cohen & Son, Louis
Continental Iron & Steel Co.
Donahoo Co.
Duquesne Elec. Mfg. Co.
Eicher, H. R.
Empire Eng. & Equip Co.
Fuller Steel & Iron Co.
Frank, M. K.
Green, L. A.
Gregory Elect. Co.
Griffith, J. A.
Independent Elect. & Machy Co.
Iron Trade Products Co.
Harris Bros. Co.
Hyman Michaels Co.
Lambert Co., H. T.
MacGovern & Co.
Mid-Continent & Equip. Co.
Miller-Owen Co.
Mining & Equip. Supply Co.
Moorhead Machy. Co.
Norton-Broadway Machy. Co.
Penn Elect. Co.
Pittsburgh Boiler Mach. Co.
Power Equip. Co.
Power Machy. Exchange
Sherwood, E. C.
Scheinert Co., R.
Standard Rail & Steel Co.
Ross Power Equip. Co.
Reading Engrg. Co.
Richmond Mill & Supply Co.
Wickes Machy. Co.
Wilson Co., E. H.
Zelnicker Supply Co.

Separator, Magentic Wet
Dings Magnetic Separator Co.

Separators, Electro Magneto
Dings Magnetic Separator Co.

Separators, Magnetic
Cutler-Hammer Mfg. Co.

Sheaves and Rollers
Fairmont Mining Machinery Co.
Medart Patent Pulley Co.
Sanford-Day Iron Works
Webster Mfg. Co.

Sheets, Black & Galvanized
American Sheet & Tin Plate Co.

Shoveling Machines
Lake Superior Loader Co., The

Shovels, Gasoline
Marion Steam Shovel Co., The

Shovels, Electric Coal
Ball Engine Co.
Myers-Whaley Co.

Shovels, Steam
Ball Engine Co.
Bellwood Steam Shovel Co.
Bucyrus Co.
Marion Steam Shovel Co., The

Signal Systems
Electric Service Supplies Co.

Sirens
Federal Electric Co.
Interstate Machine Products Co., Inc.

Solderness Connectors
Westinghouse Elec. & Mfg. Co.

Splice, Cable
American Mine Door Co., The

Splice, Trolley Wire
American Mine Door Co., The

Spouts, Magnetic
Dings Magnetic Separator Co.

Sprocket Wheels
Caldwell Co., Inc., W. E.
Medart Patent Pulley Co.

Stocks, Dies, Vises
Toledo Pipe Threading Mach. Co.

Stokers, Mechanical
American Engineering Co.
Babcock & Wilcox Co., The
Combustion Engineering Corp.

Stripping Machinery
Ball Engine Co.

Surveying Instruments (See Engineering Instruments and Supplies)

Switchboards, Power
Crouse-Hinds Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches, Frogs and Crossings
American Frog & Switch Co., The
Central Frog & Switch Co., The
Cincinnati Frog & Switch Co.,
Kilby Frog & Switch Co.
Koppel Industrial Car & Equip. Co.
Light Railway Equipment Co.
Weir Frog Co.

Tanks, Wood and Steel
Caldwell & Co., Inc., W. E.
Hauser-Stander Tank Co., The

Telephone Equipment
Paragon Electric Co.

Telephones, Mines
Electric Service Supplies Co.

Testing Laboratories (See Consulting Engs. Directory)
Koppers Co. Laboratories

Ties, Steel
Fairmont Mining Machinery Co.
Koppel Industrial Car & Equip. Co.

Tipples and Tipple Equipment
Bartlett & Snow Co., The C. O.
Fairmont Mining Machinery Co.
Jeffrey Mfg. Co., The
Link-Belt Co.
Marion Mch., Fdry. & Supply Co.
Phillips Mine & Mill Supply Co.
Webster Mfg. Co.

Towers, Water
Caldwell & Co., Inc., W. E.

Tracks, Portable Rail, etc.
American Frog & Switch Co.
Central Frog & Switch Co., The
Cincinnati Frog & Switch Co.,
Kilby Frog & Switch Co.
Koppel Industrial Car & Equip. Co.
Weir Frog Co.

Tramways, Aerial
Broderick & Bascom Rope Co.
Leschen & Sons Rope Co., A.
Waterbury Co.

Transformers
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Traps, Steam
American Blower Co.
Crane Co.
Jenkins Bros.

Trench Machines
Ball Engine Co.

Trip Feeder
Fairmont Mining Machinery Co.

Trip Makers
Fairmont Mining Machinery Co.

Trolley Material, Overhead
Electric Railway Equipment Co.
Electric Service Supplies Co.
General Iectric Co.
Ohio Brass Co., The
Westinghouse Elec. & Mfg. Co.

Trolley Wheel Bushings
Electric Railway Equipment Co.
Flood City Mfg. Co.

Trolley Wheels and Harps
Electric Railway Equipment Co.
Flood City Mfg. Co.
Ohio Brass Co., The
Westinghouse Elec. & Mfg. Co.

Trucks, Hollow Axle
Southern Wheel Co.

Turbines, Steam
Barrett, Haentjens & Co.
DeLaval Steam Turbine Co.
General Electric Co.
Midwest Engine Co.
Terry Steam Turbine Co.
Westinghouse Elec. & Mfg. Co.

Valves
Flood City Mfg. Co.
Jenkins Bros.
Lunkenheimer Co., The

Valves, Rubber Pump
Goodrich Rubber Co., B. F.

Washeries, Coal
Fairmont Mining Machinery Co.
Link-Belt Co.
Webster Mfg. Co.

Waste
Broderick & Bascom Rope Co.

Water Columns
Lunkenheimer Co., The

Water Purifying Apparatus
Permutit Co.

Water Softening and Purifying Apparatus
Schaife & Sons Co., Wm. B.

Weight Baskets (see Tipple Equipment)

Weight Recorders, Automatic
Streeter-Amet Weighing & Recording Co.

Welders, Electric, Portable, Rail Bond
Electric Railway Equipment Co.

Welding Apparatus
Electric Railway Equipment Co
General Electric Co.

Wet Magnetic Separators
Dings Magnetic Separator Co.

Wheels, Car (See Cars and Car Wheels)

Wheels, Grinding
N. Y. Belting & Packing Co.

Whistles
Federal Electric Co.
Interstate Machine Products Co.
Lunkenheimer Co., The

Wire and Cable
American Steel & Wire Co.
Anaconda Copper Mining Co.
Broderick & Bascom Rope Co.
General Electric Co.
Goodrich Rubber Co., B. F.
Hazard Mfg. Co.
Leschen & Sons Rope Co., A.
Moon Co., Geo. C.
Paragon Electric Co.
Roeblings' Sons Co., J. A.
Waterbury Co.

Are you interested in "Live" Business Propositions?

There are many excellent opportunities to sell, rent or buy equipment; engage experienced men, acquire agencies, etc., in the

SEARCHLIGHT SECTION

SEE SEARCHLIGHT SECTION

FOR EVERY BUSINESS WANT

"Think SEARCHLIGHT *First"*

SEE SEARCHLIGHT SECTION

0104

TEXACO CRATER COMPOUND has the valuable faculty of penetrating to and saturating the hemp core of wire rope

Retarding Conveyors

Double life and satisfactory service are obtained from wire rope on Retarding Conveyors by lubricating it with Texaco Crater Compound No. 1.

A thorough application before buttons are placed will penetrate clear to the hemp center—saturate it, and provide a reservoir of lubricant which can be relied upon to minimize internal friction and eliminate corrosion.

Because of the unusual penetrating action of Texaco Crater Compound No. 1, and the ease with which it is applied, desired results can be accomplished even after the buttons are in place.

Our book, "Wire Rope Lubrication," gives interesting facts and figures. It will be sent to you upon request.

THE TEXAS COMPANY

Dept. CA, 17 Battery Place, New York City

NEW YORK HOUSTON CHICAGO

Offices in Principal Cities

Kindly send me that free 32-page book that tells how to preserve and protect wire rope.

Name ..... *City* .....

Street ..... *State* .....

12-30-20

ALPHABETICAL INDEX TO ADVERTISERS

	Page
Abendroth & Root Mfg. Co.	44
Allison Coupon Co.	28
American Engineering Co.	22, 23
American Frog & Switch Co.	59
American Mine Door Co.	46
American Pulverizer Co.	42
American Sheet & Tin Plate Co.	30
American Steel & Wire Co.	65
Anaconda Copper Mining Co.	58
Atlas Car & Mfg. Co., The	51
Automatic Reclosing Circuit Breaker Co., The	47
Automatic Refrigerating Co.	43
Babcock & Wilcox Co., The	42
Ball Engine Co.	46
Barrett, Haetjens & Co.	50
Bartlet & Snow Co., C. O.	44
Bellwood Steam Shovel Co.	44
Bertha Coal Co.	42
Boyts, Porter & Co.	50
Broderick & Bascom Rope Co.	58
Buckeye Blower Co.	47
Bucyrus Co.	44
Buff & Buff Mfg. Co.	30
Caldwell Co., Inc., W. E.	42
Cement-Gun Co., Inc.	24
Central Frog & Switch Co.	65
Chattanooga Armature Wks.	46
Chicago Perforating Co.	20
Chicago Pneumatic Tool Co.	9
Cincinnati Frog & Switch Co.	62
Combustion Eng. Corp.	14, 15
Consulting Engineers	28, 29
Cory-Mann George Corp. Wm.	41
Covington Machine Co.	41
Crane Co.	44
Cross Engineering Co.	42
Crouse-Hinds Co	25
Cutler-Hammer Mfg. Co., The	46
Dean Bros. Steam Pump Works	52
De Laval Steam Turbine Co.	50
Denver Rock Drill Mfg. Co.	17
Detroit Graphite Co.	44
Dexter Co., I. H.	52
Diamond Drilling & Exploration Co.	30
Diamond Machine Co.	41
Dings Magnetic Separator Co.	48
Electric Railway Equipment Co.	45
Electric Railway Improvement Co.	47
Electric Service Supplies Co.	48
Elmore, G. H.	29
Enterprise Foundry & Machine Works	54
Erie Steam Shovel Co.	46
Fairbanks, Morse & Co.	55
Fairmont Mining Machinery Co.	4, 5
Falk Co., The	48
Fate-Root Heath Co.	61
Federal Electric Co.	46
Fleming & Son, Inc., J. R.	57
Flood City Mfg. Co.	2, 48
Flory Mfg. Co., S.	48
For Sale Ads.	31-38
Fulton Bag & Cotton Mills	30
Garlock Packing Co., The	51
General Briquetting Co.	42
General Electric Co.	26
Goodrich Rubber Co., B. F.	3d Cover
Hadfield-Penfield Steel Co.	48
Harriman Fdry. & Mch. Wks	57
Harrington & King Perforating Co.	62
Hauser-Stander Tank Co.	43
Hazard Mfg. Co.	16
Helmick Fdry.-Mach. Co.	54
Hendrick Mfg. Co.	65
Hockensmith Wheel & Mine Car Co.	56
Hoffman Bros.	28
Holmes & Bros., Inc., Robert	49
Hyatt Roller Bearing Co.	57
Interstate Machine Products Co., Inc.	46
Ingersoll-Rand Co.	13
Irwin Foundry & Mine Car Co.	52
Jeffrey Mfg. Co., The	3
Jenkins Bros.	43
Kaukauna Machine Works	45
Keasbey & Mattison Co.	28
Keystone Lubricating Co.	56
Kilby Frog & Switch Co.	56
Koppel Industrial Car & Equipment Co.	53
Koppes Co. Laboratories	28
Lake Superior Loader Co.	44
Leschen & Sons Rope Co., A.	58
Light Railway Equipment Co.	58
Link-Belt Co.	4th Cover
Little Giant Co.	45
Lobdell Car Wheel Co.	51
Lunkenheimer Co., The	27
McGowan Co., The J. H.	50
McGraw-Hill Co., Inc.	10, 20, 21, 24, 39, 60
McGraw-Hill Book Co., Inc.	19
Malcolmson Briquet Eng. Co.	42
Mancha Storage Battery Locomotive Co.	48
Manistee Iron Works Co.	52
Marion Machine Foundry & Supply Co.	41
Marion Steam Shovel Co.	44
Medart Mfg. Co., Fred	44
Medart Patent Pulley Co.	44
Michigan Pipe Co., The	44
Midwest Engine Co.	50
Mining Safety Device Co.	52
Moon Co., Geo. C.	68
Morris Machine Works	50
Morrow Mfg. Co., The	40
Myers-Whaley Co.	40
N. Y. Belting & Packing Co.	50
Ohio Brass Co., The	6
Ottumwa Iron Works	45
Paragon Electric Co.	68
Penn Pump & Compressor Co.	52
Pennsylvania Crusher Co.	42
Pennsylvania Drilling Co.	30
Permutit Co., The	30
Phillips Mine & Mill Supply Co.	54
Pittsburgh Knife & Forge Co.	52
Pittsburgh Perforating Co.	30
Portable Machinery Co.	44
Porter, H. K.	49
Positions Vacant	31
Positions Wanted	31
Punxsutawney Drilling and Contracting Co.	30
Railway Mine & Supply Co.	56
Robins Conveying Belt Co.	44
Roebling's Sons Co., J. A.	58
Sanford-Day Iron Works	56
Scaife & Sons Co., Wm B.	44
Schools and Colleges	28, 29
Searchlight Section	31-38
Second-Hand Equipment	31-38
Southern Wheel Co.	Front Cover, 56
Standard Oil Co.	55
Stimpson Equipment Co.	30
Stine, S. B.	49
Streeter-Amet Weighing and Recording Co.	40
Sullivan Machinery Co.	11, 30
Terry Steam Turbine Co.	50
Testing Engineers	28, 29
Testing Laboratories	28, 29
Texas Co., The	67
Thomas Elevator Co.	19
Toledo Pipe Threading Machine Co.	44
Traylor Engineering & Mfg. Co.	50
Tyler Co., The W. S.	8
Union Fuel Co.	40
United Iron Wks., Inc.	53
U. S. Rail Co.	58
Vulcan Iron Works	7
Want Advertisements	31
Waterbury Co.	58
Watt Mining Car Wheel Co.	52
Webster Mfg. Co.	12
Weinman Pump Mfg. Co.	18
Weir Frog Co.	59
Wellman-Seaver-Morgan Co.	48
Wesche Electric Co., B. A.	52
West Virginia Rail Co., The	58
Westinghouse Electric & Mfg. Co.	2nd Cover
Whitcomb Co., Geo. D.	48
Wickes Boiler Co., The	44
Williams Patent Crusher and Pulverizer Co., The	40
Willson Goggles Inc.	30
Wilmot Engineering Co.	42
Wyckoff & Son Co., A.	29

INDEX TO SEARCHLIGHT SECTION

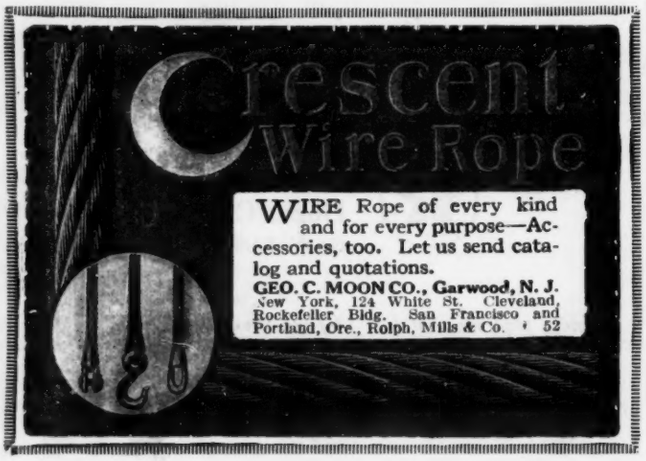
Briddell Co., Inc., W. C.	38
Carlin Machine Co., John H.	36
Carrell Co., W. A.	36
Chicago Electric Co.	60
Cohen & Son, Louis	38
Crescent Elect. & Mfg. Co.	32
Curtiss-Willis, The	36
Duquesne Electric and Manufacturing Co.	33, 35, 36
Edelblute Co., T. H.	38
Electric Motor & Repair Co., The	37
Elliott Elect. Co.	37
Empire Engrg. & Equip. Co.	36
Engineering Agency, The	31
Equipment Corp. of America	32
Green Rail & Machy. Co., L. A.	38
Greenspons Sons Iron & Steel Co., Jos.	35
Gregory Electric Co.	37
Harris Bros. Co.	36
Hyman-Michaels Co.	38
Independent Elect. Mach. Co.	37
Iron Trade Products Co.	38
Lambert Co., H. T.	32-36
MacGovern & Co., Inc.	37
Madison Coal Corp.	32
Merchants Steel & Supply Co.	38
Mid-Continent Equip. & Machy. Co.	38
Miller-Owen Elect. Co.	35
Mine Safety Appliance Co.	32
Mining Equip. & Supply Co.	35
Moorhead Machinery Co.	35
Morrison & Risman Co., The	38
National Power Machy. Co., The	36
Operators Supply Co.	38
Penn Elect. Engrg. Co.	36
Pittsburgh Boiler & Machine Co.	38
Pittsburgh Mining Machinery Co.	34
Positions Vacant	31
Positions Wanted	31
Power Equipment Co.	36
Power Machinery Exchange, Inc.	35
Randle Machinery Co., The	37
Reading Engrg. Co.	34
Ross Power Equip. Co.	35
Searchlight	31-38
Sherwood, E. C.	38
Standard Rail & Steel Co.	38
Tennessee Copper Co.	37-38
Wanted	32
Ward Machy. Co., Wm.	35
Wickes Machinery Co.	34
Willey Wray Elect. Co.	32
Wood & Lane Co.	34
Woodruff Coal & Iron Co.	31
Zelnicker Supply Co.	37

Use Ironite

Rubber Insulated Telephone Wire
for your telephone lines **IN YOUR MINES**

It has greatest possible tensile strength, toughness of insulation and flexibility and high conductivity—all the essentials for best service and durability. More serviceable than hard drawn copper and a lot cheaper. *Write for free sample.*

Paragon Electric Co. 35 West Van Buren St., Chicago



WIRE Rope of every kind and for every purpose—Accessories, too. Let us send catalog and quotations.

GEO. C. MOON CO., Garwood, N. J.
New York, 124 White St. Cleveland, Rockefeller Bldg. San Francisco and Portland, Ore., Rolph, Mills & Co. 52